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PETITION FEE
Under 37 CFR 1.17(f), (g) & (h)
TRANSMITTAL

(Fees are subject to annual revision)

Send completed form to: Commissioner for Patents
P.O. Box 1450, Alexandria, VA 22313-1450

Application Number	10/814,893
Filing Date	03/31/2004
First Named Inventor	LINK
Art Unit	3635
Examiner Name	Chapman, Jeanette
Attorney Docket Number	1658(E DILLON)

Enclosed is a petition filed under 37 CFR 1.102(d) **that requires a processing fee (37 CFR 1.17(f), (g), or (h)). Payment of $** 130 **is enclosed.**

This form should be included with the above-mentioned petition and faxed or mailed to the Office using the appropriate Mail Stop (e.g., Mail Stop Petition), if applicable. *For transmittal of processing fees under 37 CFR 1.17(i), see form PTO/SB/17i.*

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☐ The Commissioner is hereby authorized to charge the following fees to Deposit Account No._____:
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Petition Fees under 37 CFR 1.17(f): Fee $400 Fee Code 1462
For petitions filed under:
§ 1.53(e) - to accord a filing date.
§ 1.57(a) - to accord a filing date.
§ 1.182 - for decision on a question not specifically provided for.
§ 1.183 - to suspend the rules.
§ 1.378(e) - for reconsideration of decision on petition refusing to accept delayed payment of maintenance fee in an expired patent.
§ 1.741(b) - to accord a filing date to an application under § 1.740 for extension of a patent term.

Petition Fees under 37 CFR 1.17(g): Fee $200 Fee Code 1463
For petitions filed under:
§ 1.12 - for access to an assignment record.
§ 1.14 - for access to an application.
§ 1.47 - for filing by other than all the inventors or a person not the inventor.
§ 1.59 - for expungement of information.
§ 1.103(a) - to suspend action in an application.
§ 1.136(b) - for review of a request for extension of time when the provisions of section 1.136(a) are not available.
§ 1.295 - for review of refusal to publish a statutory invention registration.
§ 1.296 - to withdraw a request for publication of a statutory invention registration filed on or after the date the notice of intent to publish issued.
§ 1.377 - for review of decision refusing to accept and record payment of a maintenance fee filed prior to expiration of a patent.
§ 1.550(c) - for patent owner requests for extension of time in ex parte reexamination proceedings.
§ 1.956 - for patent owner requests for extension of time in inter partes reexamination proceedings.
§ 5.12 - for expedited handling of a foreign filing license.
§ 5.15 - for changing the scope of a license.
§ 5.25 - for retroactive license.

Petition Fees under 37 CFR 1.17(h): Fee $130 Fee Code 1464
For petitions filed under:
§ 1.19(g) - to request documents in a form other than that provided in this part.
§ 1.84 - for accepting color drawings or photographs.
§ 1.91 - for entry of a model or exhibit.
§ 1.102(d) - to make an application special.
§ 1.138(c) - to expressly abandon an application to avoid publication.
§ 1.313 - to withdraw an application from issue.
§ 1.314 - to defer issuance of a patent.

Auzville Jackson Jr. — Signature — 06/27/2005 — Date

Auzville Jackson, Jr. — Typed or printed name — 17,306 — Registration No., if applicable

This collection of information is required by 37 CFR 1.17. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 5 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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Docket 1658(EDillon)

In the United States Patent and Trademark Office

In re Application of:	Link, James B.		
Serial No.:	10/814,893	Group Art Unit:	3635
Filed:	03/31/2004	Examiner:	Chapman, Jeanette E.
For:	RETAINING WALL BLOCK		

Certificate of Mail or Transmission
I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to the addressee herein, on the date indicated below:
DATE OF DEPOSIT: 06/27/2005 By: [signature]

Mail Stop Petition
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

June 27, 2005

Petition to Make Special

Sir:

Applicant hereby requests that the subject patent application be made special. A credit card form is enclosed to pay the required fee per 37 CFR 1.17(h).

Attached hereto are:

A. Presentation of all claims directed to the invention.

B. A statement that a pre-examination search was made.

C. One copy of each of the references deemed most closely related to the subject matter.

D. A detailed discussion of the references which points out how the claimed subject matter is patentable over the references.

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A. Presentation of Claims Directed to the Invention:

1. A retaining wall block comprising:

a body having a front, rear, bottom, top, and side surfaces;

a central cavity extending vertically through said body and defining front, rear, and side walls, said walls having inner surfaces;

a front corner at the intersection of each of said side walls and said front wall;

said side walls diverging rearwardly from said front corner of said block;

a stabilizing wing extending outwardly from each of said side walls adjacent said rear surface;

each of said wings extending substantially less than a plane tangent to said front corner and perpendicular to said front surface;

two positioning wedges extending from said bottom surface, said positioning wedges including flat forward surfaces; and

said flat forward surface of said positioning wedge being located nearer said front surface than is said inner surface of said front wall;

whereby a plurality of said blocks are formed into a retaining wall by placing a lower tier of blocks with said blocks in said lower tier in contact at said front corners and forming an upper tier of blocks by placing said flat forward surfaces of said positioning wedges of said blocks of said upper tier in engagement with said inner surface of said front wall of one or more of said blocks in said lower tier.

2. The retaining wall block of claim 1 wherein said positioning wedges extend laterally from said side interior wall of said block to said side surface of said block.

3. The retaining wall block of claim 2 wherein said positioning wedges include an interior side wall portion coplanar with said inner surface of said side wall of said block and an exterior side wall portion coplanar with said side surface of said block.

4. The retaining wall block of claim 3 wherein said positioning wedges are substantially rectangular shaped.

5. The retaining wall block of claim 1 which includes channels on said top surface extending a first depth into each of said side walls.

6. The retaining wall block of claim 5 wherein said channels include flat forward edges coplanar with said front inner wall surface.

7. The retaining wall block of claim 6 wherein said channels extending said first depth accommodate said positioning wedges of said blocks in said upper tier of blocks.

8. The retaining wall block of claim 6 wherein said flat forward surface of said positioning wedges are positioned nearer said front surface of said block than said flat forward edge of said channel and said front interior wall surface thereby positioning said

front surface in said upper tier of blocks a first distance behind said front surface of said lower tier of blocks.

9. The retaining wall block of claim 8 wherein said front surface of said block includes a vertical portion extending from said bottom surface and a beveled portion extending from said vertical portion to said top surface.

10. The retaining wall block of claim 9 wherein said beveled portion extends laterally to said vertical portion by a second distance thereby enabling said blocks in said tiers of blocks to present a forward wall face including a series of vertical and beveled surfaces.

11. The retaining wall block of claim 1 wherein said side walls diverge rearwardly from said front surface at an angle of 20 degrees or greater from perpendicular with said front surface.

12. The retaining wall block of claim 1 wherein said side walls diverge rearwardly from said front surface at an angle of 27 degrees from perpendicular with said front surface.

13. The retaining wall block of claim 1 further wherein said wings have rear surfaces coplanar with said rear surface of said block.

14. The retaining wall block of claim 5 wherein said channels of said lower tier of blocks

are oriented in such a manner to accept said positioning wedges on said bottom surface of said upper tier of blocks.

15. The retaining wall block of claim 1 wherein said series of blocks in each of said tiers are stacked in a straight line to form a straight retaining wall.

16. The retaining wall block of claim 15 wherein said channels in said top surface of a lower tier of blocks in said straight retaining wall provide openings for passage of said positioning wedges in said bottom surface of an upper tier of blocks when a block of said upper tier of blocks is slidingly moved with respect to said lower tier of blocks.

17. The retaining wall block of claim 8 wherein said first distance is 0.75 inch thereby creating a setback between successive tiers of blocks.

18. The retaining wall block of claim 17 wherein the setback vertically across the face of said retaining wall is 6 degrees.

B. Statement that a Pre-Examination Search was Made:

Applicant has made a pre-examination search of the subject matter. The field of search included: U.S. Classifications 52/604, 52/603, 52/596, 52/592.6, 52/604-609, and 405/284.

C. Copy of References:

One copy is attached of each of the references deemed most closely related to the subject matter encompassed by the claims.

A copy is attached at the end of this petition of each of the following references:

1. U.S. Patent 5,505,034
2. U.S. Patent 5,941,042
3. U.S. Patent 4,909,010
4. U.S. Patent 5,161,918
5. U.S. Patent 5,294,216
6. U.S. Patent 5,484,236

D. Detailed Discussion of the References:

Please note that, for each of the references analyzed below, an element-by-element claim chart is included showing the pertinent elements in comparison to the cited reference. Each element has been assigned a letter. A remarks section follows each Table.

For analysis purposes, Claim 1 includes the following elements:

A. A retaining wall block comprising a body having a front, rear, bottom, top, and side surfaces;

B. a central cavity extending vertically through said body and defining front, rear, and side walls, said walls having inner surfaces;

C. a front corner at the intersection of each of said side walls and said front wall;

D. said side walls diverging rearwardly from said front corner of said block;

E. a stabilizing wing extending outwardly from each of said side walls adjacent said rear surface;

F. each of said wings extending substantially less than a plane tangent to said front corner and perpendicular to said front surface;

G. two positioning wedges extending from said bottom surface, said positioning wedges including flat forward surfaces; and

H. said flat forward surface of said positioning wedge being located nearer said front surface than is said inner surface of said front wall;

I. whereby a plurality of said blocks are formed into a retaining wall by placing a lower tier of blocks with said blocks in said lower tier in contact at said front corners and forming an upper tier of blocks by placing said flat forward surfaces of said positioning wedges of said blocks of said upper tier in engagement with said inner surface of said front wall of one or more of said blocks in said lower tier.

1A. U.S. Patent 5,505,034 - Element-by-Element Analysis:

Table 1 – Element-by-Element Claim Analysis of Claim 1 in view of Dueck '034:

Claim 1 Elements:	**U. S. Patent 5,505,034 (Dueck '034)**
F. each of said wings extending substantially less than a plane tangent to said front corner and perpendicular to said front surface;	Dueck's frangible extensions 28 do not extend substantially less than a plane tangent to the front corner and perpendicular to the front surface (see Fig. 1). The frangible extensions appear to extend as far as (Fig. 1) or just slightly less (Fig. 3) than the plane tangent to the front corner and perpendicular to the front surface.
G. two positioning wedges extending from said bottom surface, said positioning wedges including flat forward surfaces; and	There are no positioning wedges including flat forward faces. Dueck discloses "both embodiments of the block are provided with projecting means in the form of a pair of spaced, cylindrical extensions or knobs 18" (Col. 3, lines 6-8 and Figs. 1 and 3).
H. said flat forward surface of said positioning wedge being located nearer said front surface than is said inner surface of said front wall;	Dueck discloses cylindrical knobs 18, there are therefore no flat surfaces on Dueck's positioning knobs.
I. whereby a plurality of said blocks are formed into a retaining wall by placing a lower tier of blocks with said blocks in said lower tier in contact at said front corners and forming an upper tier of blocks by placing said flat forward surfaces of said positioning wedges of said blocks of said upper tier in engagement with said inner surface of said front wall of one or more of said blocks in said lower tier.	There are no flat forward surfaces on Dueck's knobs 18. A retaining wall can therefore not be formed using Dueck's blocks by placing **flat forward surfaces** of the positioning knobs against the inner surface of the blocks in the lower tier.

1B. U.S. Patent 5,505,034 - Remarks:

U.S. Patent 5,505,034 to Dueck '034 (hereinafter Dueck '034) discloses a block for forming a retaining wall that includes "**projecting means being laterally offset from the cavity and....having a rounded surface**" (Col. 4, lines 23-26, and Fig. 1). The rounded projecting means or "cylindrical extensions or knobs 18 are positioned on lower surface 14 to protrude into the open cavity 10 of an underlying block when the blocks are stacked atop each other to form a retaining wall" (Col. 3, lines 7-13, and Figs. 6-7).

Applicant's block includes no such projection **with a rounded surface.** Applicant's claim 1 includes "two positioning wedges extending from said bottom surface, said positioning wedges including **flat forward surfaces**".

The prosecution history of Dueck '034 reveals that the Examiner on 6/30/94 rejected all 15 claims of Dueck '034 primarily over Rossi U.S. Patent 4,964,761, Haener U.S. Patent 3,888,060, or Forsberg U.S. Patent 4,825,619. An amendment was filed on 12/29/94 that added **"having a rounded surface" to the projecting means**. See Attachment A for pages 1-11 of the amendment. Also, on page 6 it was stated that "Rossi's projection means have angled surfaces" and that "the interlocking configuration of Rossi would not accommodate rounded surfaces." Figure 10 was added to show a section of wall where the projecting means 18 of upper tier blocks 26a and 26b are engageable against the internal walls of open cavity 10 of lower tier block 25a.

Dueck '034 further discloses "the projecting means being **laterally offset from the cavity**" (Col. 4, lines 23-24, and Fig. 1). As shown in Fig. 4, Applicant's positioning wedges 52 are not laterally offset at all from the cavity, but rather the wedges 52 **extend all the way from the cavity to the side surface 32 of the block** (see Fig. 4). Applicant's claim language includes "said positioning wedges extend laterally from said side interior wall of said block to said side surface of said block" (Claim 2 of current invention).

Applicant's block further includes "each of said **wings extending substantially less than a plane tangent to said front corner and perpendicular to said front surface**" (element F, Claim 1, and Fig. 4). As shown in Fig. 4 of the current application, the stabilizing wings 48 extend substantially less than the plane (dotted line) tangent to the front corner and perpendicular to the front surface. Contrary to Applicant's block, Dueck '034's frangible extensions 28 clearly extend "beyond the side walls" (Col. 4, lines 52-53, and Fig. 1) and **clearly do not extend substantially less than a plane tangent to the front corner and perpendicular to the front surface** (see Fig. 1). Dueck '034's extensions, as shown in Fig. 1, extend all the way to a plane tangent to the front corner and perpendicular to the front surface.

The fact that the extensions on Dueck '034's block extend as far as they do lead to a significant disadvantage in forming a curved wall that is solved by the block of the current invention. Forming a curved wall with the block of the '034 patent requires the installer to break off two frangible extensions 28. The '034 patent discloses "Fig. 7 illustrates a retaining wall in which the blocks are arranged in an arcuate configuration. Rear wall portion 6 of the block includes frangible extensions 28 that extend beyond

sidewalls 8. Frangible extensions 28 can be broken off along pre-formed fault lines 29 so that each block is reduced to essentially an arcuate segment. Each block can then be rotated to a desired angle to form a curved retaining wall as shown in FIG. 7" (Col. 3, lines 41-48, and Fig. 7).

A disadvantage of the '034 patent is that the frangible extensions extend to a line perpendicular to the front face of the bloc, requiring the installer to break off the two frangible extensions when forming a curved wall. Including the frangible extensions decreases the coverage to weight ratio for a portion that eventually will be removed and discarded in the construction of a curved retaining wall, adding to wastage of material. Additionally, the top surface of a block according to the '034 patent is flat, therefore not allowing a block placed on top of a lower tier to be slid between adjacent cavities without first lifting the block to elevate the projecting means above the side walls of the blocks in the lower tier.

The retaining wall block of the present invention includes sharply diverging side walls and wings that extent substantially less than a plane tangent to the front corner and perpendicular to the front face of the block. This block geometry enables construction of either a straight or curved retaining wall without requiring any portion of the blocks to be broken away, thereby decreasing wastage and increasing the coverage to weight ratio of the blocks. The block of the present invention also includes channels (claim 5) formed in the top surface of the blocks, thereby allowing a block in a straight wall to be repositioned without requiring it to be lifted to clear the side walls of the blocks in the lower tier.

The block of the present invention therefore significantly simplifies construction of a retaining wall by decreasing the weight of the block for a given coverage area, by virtue of the channels in the top surface making it easier for the block to be repositioned, and by including non-frangible extensions that do not need to be broken off in order to form a curved wall.

For the reasons enumerated above, including 1) applicant's projecting means are not laterally offset from the cavity as in Dueck '034; 2) applicant's projecting means have flat forward surfaces rather than a rounded surface as in Dueck '034; 3) applicant's wings extending substantially less than a plane tangent to said front corner and perpendicular to said front surface whereas Dueck '034's wings extend all the way to the tangent plane; and 4) applicant's top surface includes a channel to allow blocks to be slid sideways without lifting whereas Dueck '034's block has a flat top surface and no channels; Applicant's block is not anticipated by Dueck '034.

2A. U.S. Patent 5,941,042 - Element-by-Element Analysis:

Table 2 – Element-by-Element Claim Analysis of Claim 1 in view of Dueck '042:

Claim 1 Elements:	**U. S. Patent 5,941,042 (Dueck '042)**
F. each of said wings extending substantially less than a plane tangent to said front corner and perpendicular to said front surface;	Dueck's frangible extensions 28 do not extend substantially less than a plane tangent to the front corner and perpendicular to the front surface (see Fig. 1). The frangible extensions appear to extend as far as (Fig. 1) or just slightly less (Fig. 3) than the plane tangent to the front corner and perpendicular to the front surface.
G. two positioning wedges extending from said bottom surface, said positioning wedges including **flat forward surfaces**; and	There are no positioning wedges including flat forward faces. Dueck discloses "projecting means being laterally, outwardly, and rearwardly offset from said cavity front internal wall and **having a rounded front surface**" (Col. 3, lines 18-22, and Fig. 1).
H. said flat forward surface of said positioning wedge being located **nearer** said front surface than is said inner surface of said front wall;	No. Dueck's projecting means are "rearwardly offset from said cavity front internal wall". Dueck discloses "projecting means integrally formed on said bottom surface proximate said front surface and being laterally offset from said cavity and **rearwardly offset** from the front of the cavity and having a rounded front surface" (Col. 1, lines 18-21). Therefore Dueck's knobs 18 are positioned **farther** from the front surface than is the inner surface of the front wall (See Figs. 1 and 3).

2B. U.S. Patent 5,941,042 - Remarks:

U.S. Patent 5,941,042 to Dueck (hereinafter Dueck '042) discloses a block for forming a retaining wall that includes "**projecting means being laterally, outwardly, and rearwardly offset from said cavity front internal wall and having a rounded front surface**" (Col. 3, lines 18-22, and Fig. 1).

Dueck '042 therefore has many of the same limitations as the previous Dueck '034 reference. As has been explained thoroughly in the discussion above regarding Dueck '034, Applicant's block has projecting means that are **not laterally offset from the cavity front internal wall** and the **projecting means do not have a rounded front surface**. Furthermore, Applicant's projecting means (see Figs. 3 and 4) are **not rearwardly offset from the cavity front internal wall** but rather forwardly offset from the cavity front internal wall.

As compared to the block of Dueck '042, Applicant's block includes all the distinctive differences as given above for Dueck '034. Additionally, applicant's projecting means are not rearwardly offset from the cavity front internal wall. Applicant's block is therefore not anticipated by Dueck '042.

3A. U.S. Patent 4,909,010 - Element-by-Element Analysis:

Table 3 – Element-by-Element Claim Analysis of Claim 1 in view of Gravier:

Claim 1 Elements:	**U. S. Patent 4,909,010 (Gravier)**
B. a central cavity extending vertically through said body and defining front, rear, and side walls, said walls having inner surfaces;	There are two central cavities and therefore two sets of front, rear, and side walls.
E. a stabilizing wing extending outwardly from each of said side walls adjacent said rear surface;	The block is rectangular, there are no outwardly extending wings.
F. each of said wings extending substantially less than a plane tangent to said front corner and perpendicular to said front surface;	There are no wings.
G. two positioning wedges extending from said bottom surface, said positioning wedges including flat forward surfaces; and	The bottom surface is flat (see Figs. 4 and 5). There are no wedges extending from the bottom surface of the block.
H. said flat forward surface of said positioning wedge being located nearer said front surface than is said inner surface of said front wall;	There is no positioning wedge.
I. whereby a plurality of said blocks are formed into a retaining wall by placing a lower tier of blocks with said blocks in said lower tier in contact at said front corners and forming an upper tier of blocks by placing said flat forward surfaces of said positioning wedges of said blocks of said upper tier in engagement with said inner surface of said front wall of one or more of said blocks in said lower tier.	There are no positioning wedges to engage the inner surface of the front wall of a block in a lower tier of blocks.

3B. U.S. Patent 4,909,010 - Remarks:

U.S. Patent 4,909,010 to Gravier (hereinafter Gravier) discloses a rectangular shaped block having two central cavities. There are no extending wings and no positioning wedges extending from the bottom surface.

Applicant's block is therefore not anticipated by Gravier.

4A. U.S. Patent 5,161,918 - Element-by-Element Analysis:

Table 4 – Element-by-Element Claim Analysis of Claim 1 in view of Hodel:

Claim 1 Elements:	**U. S. Patent 5,161,918 (Hodel)**
E. a stabilizing wing extending outwardly from each of said side walls adjacent said rear surface;	There are no stabilizing wings disclosed by Hodel.
F. each of said wings extending substantially less than a plane tangent to said front corner and perpendicular to said front surface;	There are no stabilizing wings.
G. two positioning wedges extending from said bottom surface, said positioning wedges including flat forward surfaces; and	There are no positioning wedges extending from the bottom surface of Hodel's block.
H. said flat forward surface of said positioning wedge being located nearer said front surface than is said inner surface of said front wall;	There are no positioning wedges.
I. whereby a plurality of said blocks are formed into a retaining wall by placing a lower tier of blocks with said blocks in said lower tier in contact at said front corners and forming an upper tier of blocks by placing said flat forward surfaces of said positioning wedges of said blocks of said upper tier in engagement with said inner surface of said front wall of one or more of said blocks in said lower tier.	There are no positioning wedges integral with the blocks to assist in building a retaining wall. Hodel's blocks are "interlocked together by offset pins 26" (Col. 3, lines 23-24) which extend into "vertical through-holes 46" (Col. 3, lines 46-47 and Fig. 1), which "extend completely through the front corner portions of the block" (Col. 3, lines 47-48).

4B. U.S. Patent 5,161,918 - Remarks:

U.S. Patent 5,161,918 to Hodel (hereinafter Hodel) discloses a block that is "trapezoidal in plan view" (Abstract, lines 3-4). There are no stabilizing wings and no positioning wedges. Hodel's blocks are positioned by separate pins 26 which fit into holes 46 (see Figs. 1 and 2) that are formed in the blocks. There are no positioning wedges integral with the blocks to assist in building a retaining wall. Hodel's blocks are "interlocked together by offset pins 26" (Col. 3, lines 23-24) which extend into "vertical through-holes 46" (Col. 3, lines 46-47 and Fig. 1), which "extend completely through the front corner portions of the block" (Col. 3, lines 47-48).

Applicant's block is not anticipated by Hodel.

5A. U.S. Patent 5,294,216 - Element-by-Element Analysis:

Table 5 – Element-by-Element Claim Analysis of Claim 1 in view of Sievert:

Claim 1 Elements:	**U. S. Patent 5,294,216 (Sievert)**
B. a central cavity extending vertically through said body and defining front, rear, and side walls, said walls having inner surfaces;	There is no central cavity extending through the body. There is no cavity of any type.
D. said side walls diverging rearwardly from said front corner of said block;	Neither of Sievert's embodiments (Figs. 2 and 5) show side walls diverging from the front corners. For the side walls to diverge, the angle between the block's front surface and the side wall would have to be greater than 90°. Sievert discloses "the sidewall first part extend from the block front surface towards the back surface at an angle of no greater than ninety degrees in relationship to the block front surface" (Col. 4, lines 26-29).
E. a stabilizing wing extending outwardly from each of said side walls adjacent said rear surface;	There are no stabilizing wings.
F. each of said wings extending substantially less than a plane tangent to said front corner and perpendicular to said front surface;	There are no stabilizing wings.
G. two positioning wedges extending from said bottom surface, said positioning wedges including flat forward surfaces; and	Sievert does not disclose a pair of positioning wedges extending from the bottom surface. Sievert discloses a single "flange 40 spanning the width of the block back surface 24" (Col. 4, lines 32-33 and see Fig. 3).
H. said flat forward surface of said positioning wedge being located nearer said front surface than is said inner surface of said front wall;	There are no positioning wedges.

I. whereby a plurality of said blocks are formed into a retaining wall by placing a lower tier of blocks with said blocks in said lower tier in contact at said front corners and forming an upper tier of blocks by placing said flat forward surfaces of said positioning wedges of said blocks of said upper tier in engagement with said inner surface of said front wall of one or more of said blocks in said lower tier.	There are no positioning wedges and, since there are no cavities in Sievert's block, no front wall having an inner surface.

5B. U.S. Patent 5,294,216 - Remarks:

U.S. Patent 5,294,216 to Sievert (hereinafter Sievert) discloses a block that has "an irregular trapezoidal shaped block body 20" (Col. 4, lines 11-12 and Fig. 1). There is no central cavity disclosed by Sievert (see Figs. 1 and 4).

Neither of Sievert's embodiments (Figs. 2 and 5) show side walls diverging from the front corners. For the side walls to diverge, the angle between the block's front surface and the side wall would have to be greater than 90°. Sievert discloses "the sidewall first part extend from the block front surface towards the back surface at an angle of no greater than ninety degrees in relationship to the block front surface" (Col. 4, lines 26-29).

Sievert's block has no stabilizing wings.

Furthermore Sievert does not disclose a pair of positioning wedges extending from the bottom surface. For positioning the block, Sievert discloses only a single "flange 40 spanning the width of the block back surface 24" (Col. 4, lines 32-33 and see Fig. 3).

Applicant's block is not anticipated by Sievert.

6A. U.S. Patent 5,484,236 - Element-by-Element Analysis:

Table 6 – Element-by-Element Claim Analysis of Claim 1 in view of Gravier:

Claim 1 Elements:	**U. S. Patent 5,484,236 (Gravier)**
E. a stabilizing wing extending outwardly from each of said side walls adjacent said rear surface;	There are no outwardly extending wings disclosed by Gravier.
F. each of said wings extending substantially less than a plane tangent to said front corner and perpendicular to said front surface;	There are no wings disclosed by Gravier, nor any stipulation of the distance the wings would extend from a plane tangent to the front corner and perpendicular to the front surface.
G. two positioning wedges extending from said bottom surface, said positioning wedges including flat forward surfaces; and	There are no wedges extending from the bottom surface of Gravier's block. Gravier discloses "a laterally extending rectangular recess 48 extends thereunder" (Col. 5, lines 47-48) on the bottom surface of the block (see Fig. 8). There is nothing extending from the bottom surface of Gravier's block.
H. said flat forward surface of said positioning wedge being located nearer said front surface than is said inner surface of said front wall;	There is no positioning wedge extending from the bottom surface.
I. whereby a plurality of said blocks are formed into a retaining wall by placing a lower tier of blocks with said blocks in said lower tier in contact at said front corners and forming an upper tier of blocks by placing said flat forward surfaces of said positioning wedges of said blocks of said upper tier in engagement with said inner surface of said front wall of one or more of said blocks in said lower tier.	There are no positioning wedges in Gravier to engage the inner surface of the front wall of a block in a lower tier of blocks. As stated in claim element B above, Applicant's central cavity "extends vertically through the body and defines the front, rear, and side wall, said walls having inner surfaces". The vertical surface 54 of the blocks in Gravier's upper tier do not engage the inner surface of the front wall of the blocks in the lower tier (see Fig. 3) but rather engage the lip 34 that extends

	completely across the top surface of the block. There is nothing in Gravier disclosing or suggesting an extension from the bottom surface to extend within the cavity of the block in the lower tier and engage the front wall.

6B. U.S. Patent 5,484,236 - Remarks:

U.S. Patent 5,484,236 to Gravier (hereinafter Gravier '236) discloses a block that may be "trapezoidal shaped' (Col. 2, line 57, and Fig. 8). Gravier '236 does not disclose outwardly extending wings (element E), let alone a limitation on the extension of the wings from a plane tangent to the front corner and perpendicular to the front surface (element F).

Gravier '236 does not disclose positioning wedges extending from the bottom surface (element G) and no relationship between the location of a flat forward surface of a positioning wedge with respect to the inner surface of the front wall (element H).

Additionally, there are no positioning wedges in Gravier '236 to engage the inner surface of the front wall of a block in a lower tier of blocks (element I). The vertical surface 54 of the blocks in the upper tier of Gravier '236 do not engage the inner surface of the front wall of the blocks in the lower tier (see Fig. 3) but rather engage the lip 34 that extends completely across the top surface of the block. There is nothing in Gravier '236 disclosing or suggesting an extension from the bottom surface to extend within the cavity of the block in the lower tier and engage the front wall. There is a fundamental

difference in the way the blocks of Gravier '236 engage each other as compared to the blocks of the present invention. With the lip 34 extending all the way across the top surface, and the vertical surface 54 extending all the way across the bottom surface (see Figs. 7 and 8), the vertical surface 54 of the block in the upper tier engages the lip 34 of the block in the lower tier at the ends of the vertical surface.

Applicant's block is therefore not anticipated by Gravier '236.

D. Conclusion:

It is believed that, as shown in the above analyses, the current invention is patentable over the known prior art. The current invention is not anticipated by any of the relevant references, nor is there any suggestion or motivation in the references to provide a block as claimed in the current invention, including the following elements: 1) two positioning wedges having flat forward surfaces; 2) wings extending substantially less than a plane tangent to the front corner and perpendicular to the front surface; 3) the flat forward surfaces of the positioning wedges located nearer the front surface than is the inner surface of the front wall; and 4) forming a retaining wall by placing flat forward surfaces of positioning wedges in engagement with the inner surfaces of the front walls of one or more blocks in a lower tier of blocks.

Applicant herein requests that the application be made special in order to lead to an early resolution of the patentability of the invention.

Respectfully submitted,

6/27/05

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Attachment A

J. Danford
1-25-95

PATENT

Attorney Docket No. 80111
Client Reference No. 16448-1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:

Vernon J. Dueck

Serial No.: 08/146,278

Filed: November 2, 1993

For: RETAINING WALL BLOCK

Examiner: W. Yip

Art Unit: 3504

AMENDMENT

Commissioner of Patents and Trademarks
Washington, D.C. 20231

Sir:

In response to the Office Action (paper no. 3) mailed June 30, 1994, and after accepting the attached petition for extension of time and late fee, please amend the application as follows:

IN THE SPECIFICATION:

On page 4, line 9, delete "and";

On page 4, line 11, delete "." and insert --; and--;

On page 4, after line 11, insert --Figure 10 is a plan view of a section of a wall constructed from the blocks of Figure 3.--;

a'

On page 7, before the last paragraph, insert

--Figure 10 illustrates a plan section of a wall constructed from blocks of the embodiment illustrated in Figure 3. The projecting means 18 of upper tier blocks 26a and 26b are engageable against the internal walls of open cavity 10 of lower tier block 25a, where all frangible extensions 28 have been broken off.--.

IN THE CLAIMS:

Please amend claims 1, 2 and 11, cancel claims 8-10 without prejudice, and insert new claims 16-20, as follows:

~~1. (once amended) A block for forming a retaining~~ wall comprising:

a generally parallelepiped body with front, rear, top, bottom and side surfaces and a central internal cavity with internal walls;

projecting means integrally formed on the bottom surface adjacent the front surface and positioned for protruding into the central cavity of at least one other underlying block in a wall formed from the blocks, the projecting means <u>having a rounded surface and</u> being engageable against the internal walls of the open cavity to position the block in the retaining wall in offset relation to underlying blocks.

2. (once amended) A block for forming a retaining wall comprising:

spaced front and rear wall portions;

a pair of sidewalls extending between and joining the front and rear wall portions to define a central open cavity in the block having internal walls;

the block having an upper surface and a lower surface;

projecting means integrally formed on the side walls adjacent the front wall portion and positioned for protruding ~~into the open cavity of at least one other underlying block in a~~

wall formed from the blocks, the projecting means having one rounded surface and being engageable against the internal walls of the open cavity to position the block in offset relation to ~~underlying blocks.~~

11. (once amended) A retaining wall comprising:

a lower tier of individual blocks arranged side by side, each block having a body with an internal cavity having internal walls;

an upper tier of individual blocks arranged side by side, each block having [integrally formed] projecting means with one rounded surface and being integrally formed on a lower surface of the block;

the upper tier being positioned on top of the lower tier with the projecting means of the upper tier being inserted within corresponding internal cavities of the lower tier to abut an internal wall of the cavities, with projecting means of adjacent blocks being inserted into the same internal cavity of a block in the lower tier, thereby positioning the blocks of the upper and lower tiers with respect to each other, the projecting means and the internal cavity being dimensioned and positioned such that the blocks of the upper tier are offset rearwardly and laterally from the blocks of the lower tier.

--~~16.~~ 7 (new) A retaining wall as claimed in claim ~~11~~, 6 wherein the internal cavities are filled with granular fill.

~~17.~~ 9 (new) A retaining wall as claimed in claim ~~12~~, 8 wherein the internal cavities are filled with granular fill.

~~18.~~ 11 (new) A retaining wall as claimed in claim ~~13~~, 10 wherein the internal cavities are filled with granular fill.

19. 13 (new) A retaining wall as claimed in claim 14, 12 wherein the internal cavities are filled with granular fill.

20. 15 (new) A retaining wall as claimed in claim 15, 19 wherein the internal cavities are filled with granular fill.--

REMARKS

With the addition of new claims 16-20 and the deletion of claims 8-10, claims 1-7, 11-20 are now pending in this case.

Amendments to the specification (page 4, new page 7, and new Figure 10) are inherent from the specification as filed. In particular, the amendments to the specification concern the interaction of the blocks in which the projecting means of an upper tier block are illustrated as engaging a lower tier block. No new matter has been added.

Support for the amendments to claims 1, 2 and 11 is found in the Figures 1-5 and associated text describing the rounded nature of the projecting means.

Support for new claims 16-20 is found on page 5 of the specification, first full paragraph, regarding the filling of the internal cavities with dirt and gravel, i.e. granular fill.

References to paragraphs below are to the outstanding Office Action.

In paragraph 1, the Examiner objected to the drawings under C.F.R. §1.83(a) as failing to show every feature of the claimed invention; specifically, "the projecting means being engageable against the internal walls of the open cavity" in claims 1 and 11, and "the rectangular projection . . . for a close fit within the internal cavity of another block" in claim

8. Applicant submits the attached informal Figure 10, which shows these features. Upon the Examiner's approval of the informal Figure 10, in particular, and of the application generally, the Applicant will submit formal drawings, including those necessary to satisfy Notice re Patent Drawings, PTO-948.

In paragraph 2, the Examiner objected to the specification under 35 U.S.C. §112, first paragraph, as failing to provide an enabling disclosure. Specifically, the Examiner asked how the retaining wall could stand on the ground if the lower tier has projecting means directed downwardly from its lower surface.

The Applicant explains as follows: The average workman in the art would naturally take any appropriate measures to remove or reduce any excess block, including protrusions, to accommodate the actual site environment. Manufacturing inconsistencies in the blocks, unexpected aberrations of the site and the like, are commonly addressed by one skilled in the art. By means of a hammer, masonry saw, chisel or other conventional tools, the artisan would do whatever was necessary by conventional means, to make the blocks fit each other and to build the wall on the site contracted for. For the present invention, on sites which required such action, the artisan might knock off the projecting means of the lower tier, with a hammer. On some sites, removal of the projecting means of the lower tier would not be necessary because those projections would sink securely into the ground or underlying structure. In fact, on some sites, removal would be counterproductive because the projections are part of a "key and lock" configuration to anchor the wall. For example, a concrete base is poured and the lower tier is placed on that base at the appropriate time while the concrete base is setting. A quickly accessible (although not the best) example of anchoring projections into the ground can be

seen in cited Forsberg '619, Figure 10 or Ross '761. In summary, the artisan would properly erect the wall with the blocks, as disclosed and claimed in the present application.

In paragraph 3, the Examiner rejected claims 11-15 for the same reasons as set out in paragraph 2, above. Reconsideration is respectfully requested for the reasons discussed above.

In paragraph 4, the Examiner rejected claims 11-15 under 35 U.S.C. §112, second paragraph, as being indefinite. Specifically, it was not clear to the Examiner in claims 11 and 12, whether "each block" and in claim 12 whether "all the blocks", meant that the blocks in the lower tier were the same as those of the upper tier. The answer is affirmative for the reasons explained above.

In paragraph 6, the Examiner rejected claims 1 and 11-13 under 35 U.S.C. §102(b) as being anticipated by Rossi '761. Reconsideration is requested in view of the amendments to claim 1 and to claim 11 (on which claims 12-13 ultimately depend), in which the projecting means are recited as having one rounded surface. In contrast, the Rossi projecting means have angled surfaces. Accordingly, Rossi does not anticipate claims 1 and 11-13.

Furthermore, the amended claims are not obvious in view of Rossi '761. The interlocking configuration of Rossi would not accommodate rounded surfaces. Rounded surfaces are structurally alien because Rossi teaches blocks which interlock with each other in a rigid, linear or orthogonal way, to produce linear walls. The only exception is the non-linear wall embodiment of Figures 12 and 13. As explained in the associated text (col. 4, lines 50-57 and col. 6, lines 20-30), the only interconnecting

means of the block is a forward slot 34. However, it is not clear how the blocks in this embodiment interlock sufficiently to operate as a retaining wall.

In paragraph 7, the Examiner rejected claims 1-2 and 6-10 under 35 U.S.C. §102(b) as being anticipated by Haener '060. Reconsideration is requested in view of the amendment to claim 1 and to claim 2 (on which claims 6-10 depend), in which the projecting means are recited as having one rounded surface. In contrast, the Haener projecting means have angled surfaces. Thus, Haener does not anticipate claims 1, 2 and 6-10.

Furthermore, the amended claims are not obvious in view of Haener '060. The interlocking configuration of Haener would not accommodate rounded surfaces. Rounded surfaces are structurally alien to Haener because Haener teaches blocks which interlock with each other in a rigid, linear or orthogonal way, to produce non-arcuate walls.

In paragraph 8, the Examiner rejected claims 11-15 under 35 U.S.C. §102(b) as being anticipated by Forsberg '619. Reconsideration is respectfully requested in view of the following submissions.

The Examiner characterized Forsberg as disclosing, in Figure 10, projecting means 52 integrally formed on the lower surface inserted into corresponding internal cavity 39 of a lower block. Applicant believes that, after reading paragraph 8 in its entirety, reference is more appropriately made to projecting means 51 and the cavities of the 43 series in Figure 10. The lower tier projecting means 52, which the Examiner referenced, protrude into the ground.

Applicant respectfully disagrees with the Examiner's position because the projecting means 51 are not integral with the blocks, as is now recited in claims 1, 2 and 11. The projection means are really pins which are inserted into the 43 series cavities and are made of metal or reinforced plastic (column 4, lines 44-45), which are inserted into their associated holes during the construction of the wall: they never become integral with the blocks. The differences between the family of integral projection configurations (represented by the present application) and the family of discrete pin configurations (represented by Forsberg), with their respective and distinct advantages and disadvantages, are well known and represented in the art. For example, it is alleged by proponents of the latter configurations that storage and transport is facilitated by blocks not having integral projections.

Furthermore, it is clear that there is a one-to-one correspondence between cavities and projecting means in Forsberg. In fact, it is more illuminating to describe the Forsberg configuration as a "pin and hole" system. In contrast, the present invention discloses a single internal cavity which accommodates a knob from one overlying block and a knob from another overlying block: i.e., there is a two-to-one correspondence between projecting means and cavities. The structural difference with the Forsberg "pin and hole" configuration is clearly set out in the amended claim 11 (on which claims 12-15 depend), wherein two projecting means are recited as being inserted into a single cavity of an underlying block. Accordingly, claims 11-15 are not anticipated by Forsberg.

Furthermore, the amended claims 11-15 are not obvious in view of Forsberg. In Forsberg, there are cavities (for example, 21 and 24, in Figures 2-4) to accommodate the granular fill (column 4, lines 40-41), and there are separate holes (for

example, 43 and 44 in Figures 2-4) to accommodate the pins. In contrast, the present invention teaches one internal cavity (10 in Figures 1-5) which performs two functions: it accommodates the (two) knobs of the overlying blocks and also receives the dirt and gravel. Forsberg provides no motivation for one skilled in the art would to merge the "pin holes" with the "dirt and gravel holes". Accordingly, claims 11-15 are patentably distinguishable over Forsberg.

In paragraph 10, the Examiner rejected claims 1-15 under 35 U.S.C. §103 as being unpatentable over Forsberg '619, in view of European patent no. 013535 and further in view of Hunt '472. Specifically, the Examiner thought it would have been obvious to modify the Forsberg block with two projections as taught by French [sic] reference '535. Reconsideration is requested in view of the following submissions.

First, claims 11-15 are allowable over Forsberg, '535 and Hunt for the reasons discussed above.

Second, it is respectfully submitted that the combination proposed by the Examiner is improper. It is accepted practice and law that obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching or suggestion supporting the combination. ACS Hospital Systems, Inc. v. Montefiore Hospital 221 USPQ 929 at 933. The references must expressly or impliedly suggest the claimed combination or the Examiner must present a convincing line of reasoning as to why the artisan would have found the claimed invention to be obvious in light of the teaching of the references. Ex parte Clapp 227 USPQ 972 at 973.

There is no explicit or implicit suggestion in Forsberg to depart from its "pin and hole" configuration. Furthermore, it

would be a severe structural change for one skilled in the art to start from the relatively precise "pin and hole" configuration of Forsberg, and arrive at the gross projections and cavities of reference '535; or vice versa. As explained above, there are two distinct structural families of interlocking systems-those employing the discrete "pin and hole" configuration and those having integral projections.

Indeed, to combine the rotatable configuration disclosed by Forsberg with non-rotatable configurations, such as those shown by Hunt and European reference '535 would be counter-intuitive. The upper tier blocks of Forsberg are designed to be positionable, within limits, in a radial or oblique relationship with corresponding blocks of a lower tier, so as to produce an arcuate wall. That is, the Forsberg block is pivotable, within limits, about its "pin and hole" axes before being set into final position. This process and structural result would be difficult, if not impossible, with the Hunt and '535 configurations.

With regard to new claims 16-20, one key feature is the filling of the internal cavities with granular fill. These new claims are clearly patentable over Forsberg because in the Forsberg configuration, it is not suggested that granular fill be inserted with the pin into their corresponding holes. In fact, such a suggestion would be unthinkable. The present invention, as claimed in these new claims, clearly sets out an important structural improvement over Forsberg. In Forsberg, there is a cavity to accommodate the granular fill, and there are separate holes to accommodate the pins; whereas in the present invention, one internal cavity performs two functions: it accommodates the knobs of the overlying blocks and granular fill.

CONCLUSION

In view of the foregoing, Applicant believes all claims now pending in this application are in condition for allowance, and respectfully solicits a Notice of Allowance, conditional upon the submission of formal drawings and the filing of a certified copy of the priority document.

If the Examiner believes a telephone conference would expedite prosecution of this application, please telephone the undersigned at (415) 543-9600.

Respectfully submitted,

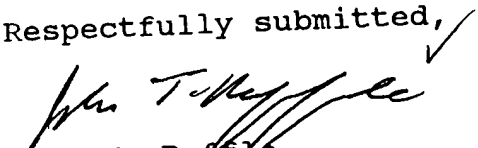

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Fig. 6

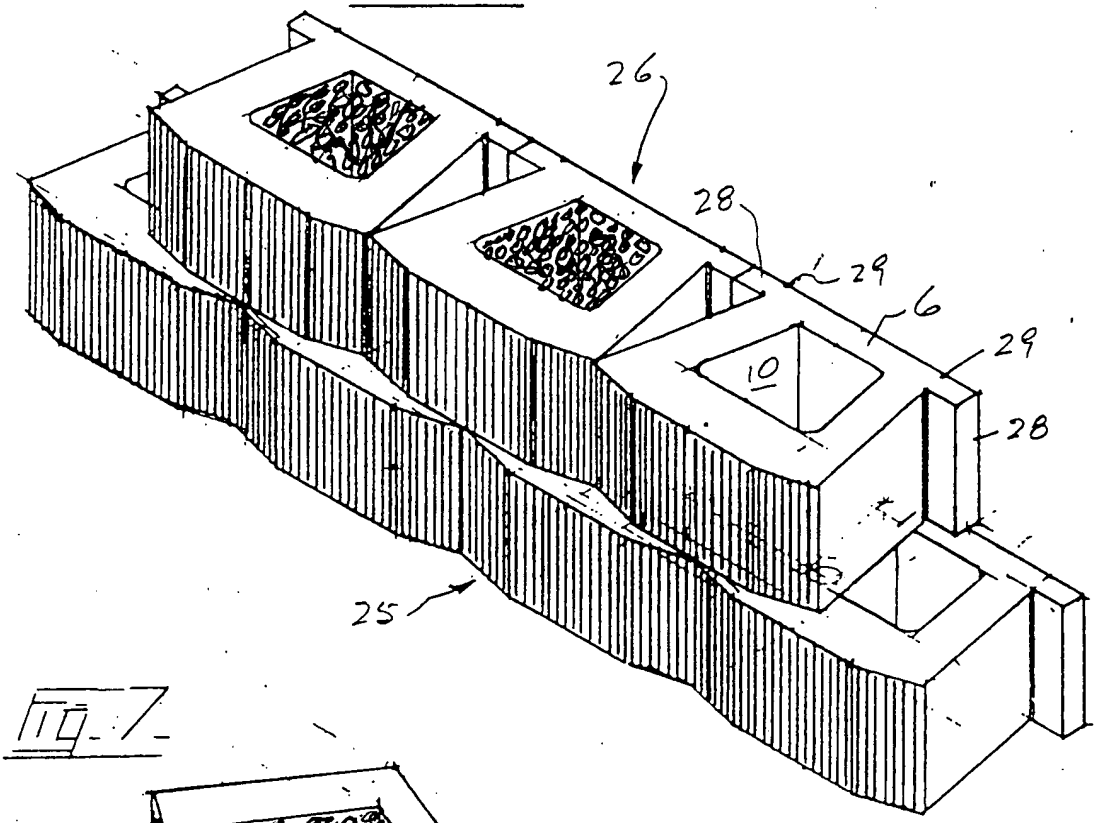

Fig. 7

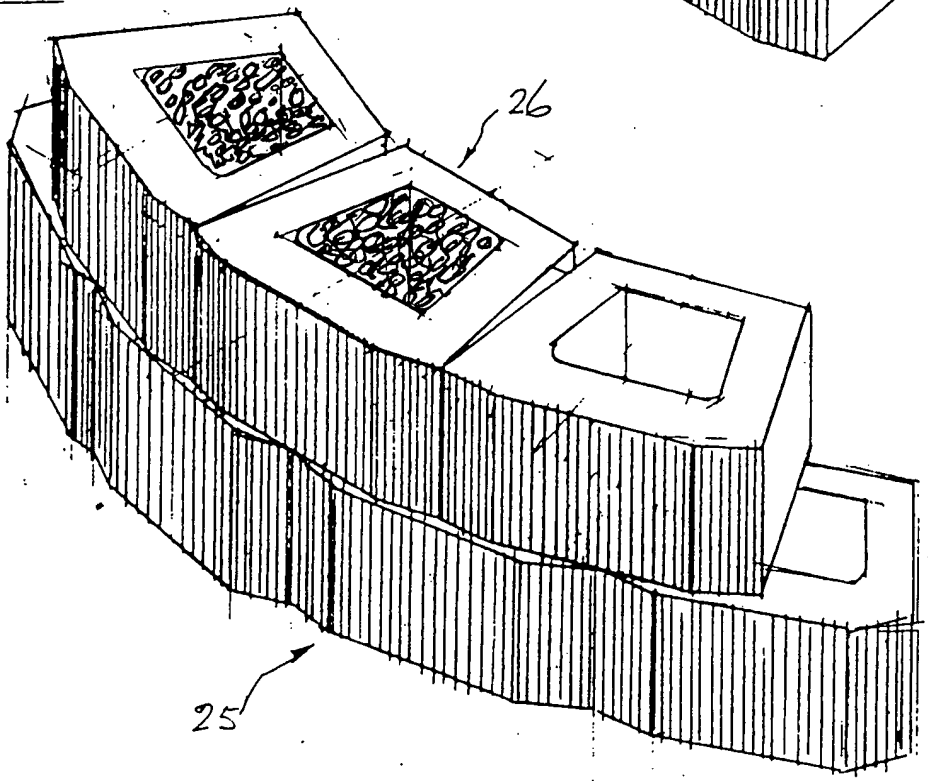

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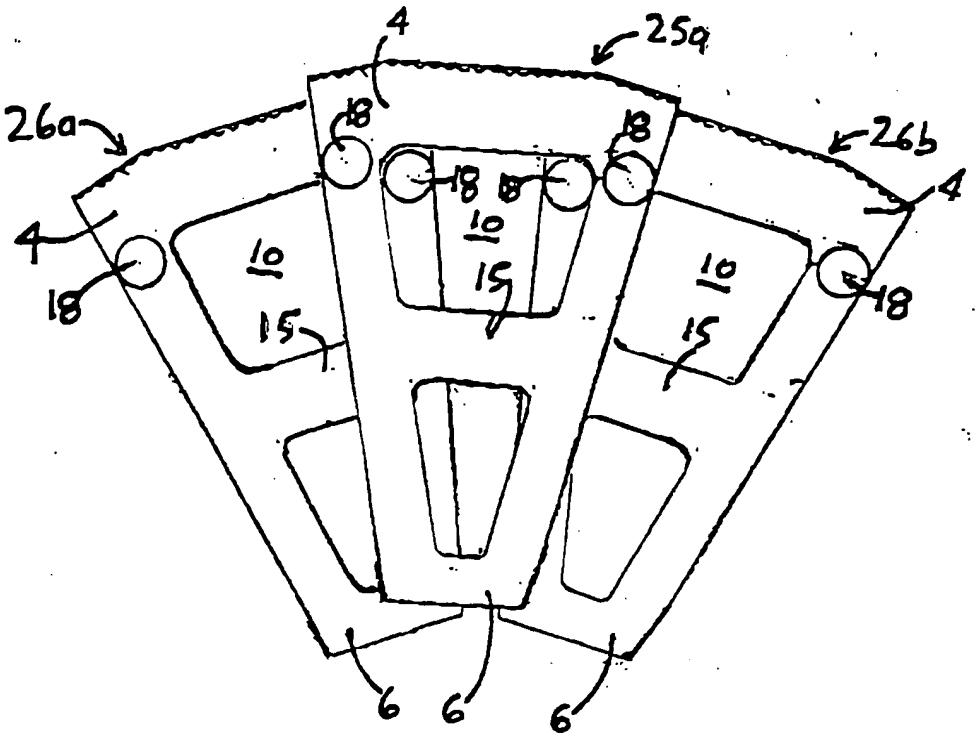
FIG. 10



US005505034A

United States Patent [19]

Dueck

[11] Patent Number: 5,505,034

[45] Date of Patent: Apr. 9, 1996

[54] RETAINING WALL BLOCK

[75] Inventor: Vernon J. Dueck, Burnaby, Canada

[73] Assignee: Pacific Pre-Cast Products, Ltd., Burnaby, Canada

[21] Appl. No.: 146,278

[22] Filed: Nov. 2, 1993

[51] Int. Cl.[6] E04C 1/00

[52] U.S. Cl. 52/604; 52/603; 52/596; 52/592.6; 52/589.1; 405/286

[58] Field of Search 52/169.4, 604–609, 52/596, 592.6, 589.1; 405/284, 286, 262, 272

[56] References Cited

U.S. PATENT DOCUMENTS

2,892,340	6/1959	Fort .	
3,888,060	6/1975	Haener	52/592.4
4,083,190	4/1978	Pey	52/608 X
4,107,894	8/1978	Mullins	52/592.6
4,229,123	10/1980	Heinzmann	52/608 X
4,372,091	2/1983	Brown et al.	52/604
4,671,706	6/1987	Giardini	405/286
4,825,619	5/1989	Forsberg	52/562
4,860,505	8/1989	Bender	52/98
4,896,472	1/1990	Hunt	52/592.6
4,920,712	5/1990	Dean	52/169.4
4,964,761	10/1990	Rossi	405/286
4,965,979	10/1990	Larrivee	52/606 X
5,017,049	5/1991	Sievert	405/286
5,044,834	9/1991	Janopaul	405/284
5,161,918	11/1992	Hodel	52/606 X

FOREIGN PATENT DOCUMENTS

0013535	7/1980	European Pat. Off. .	
0488917	11/1918	France	52/592.6

Primary Examiner—Carl D. Friedman
Assistant Examiner—Winnie S. Yip
Attorney, Agent, or Firm—Townsend and Townsend and Crew

[57] ABSTRACT

A block for forming a retaining wall comprising a generally parallelepiped body with front, rear, top, bottom and side surfaces and a central internal cavity with internal walls. Integrally formed protruding knobs are formed on the bottom surface adjacent the front surface and are positioned for protruding into the central cavity of at least one other block in a wall formed from the blocks. The protruding knobs are adapted to abut the internal walls of the open cavity to position the block in the retaining wall. A wall construction using the blocks is provided.

17 Claims, 4 Drawing Sheets

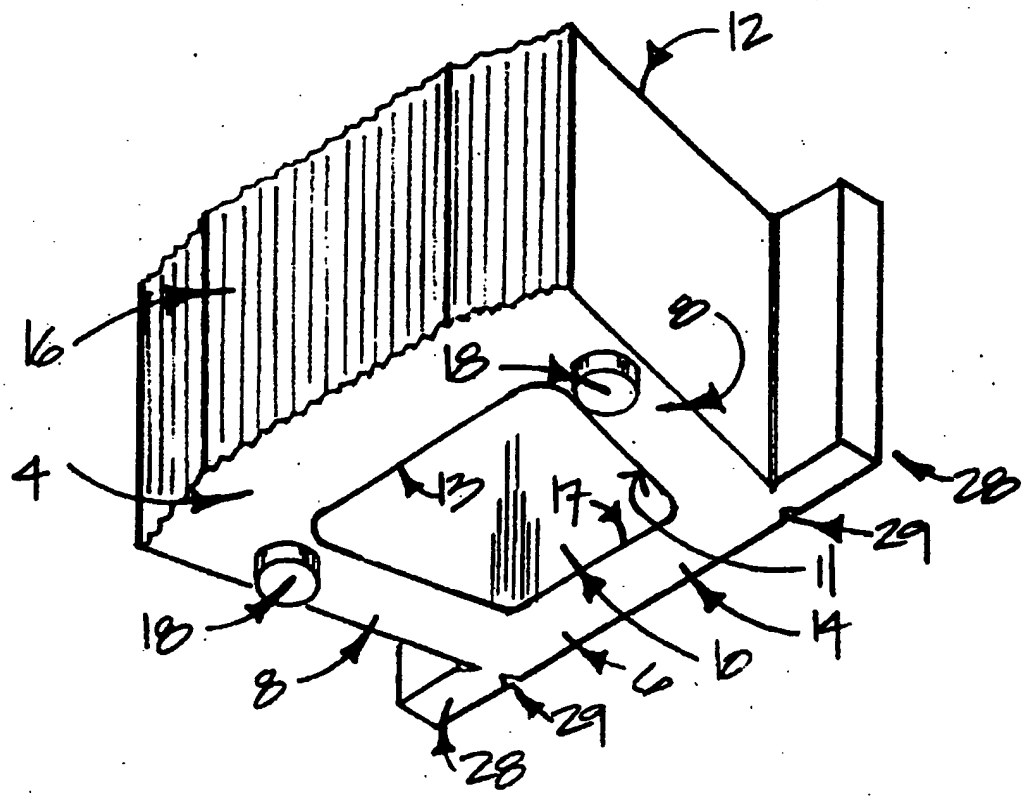


FIG. 1

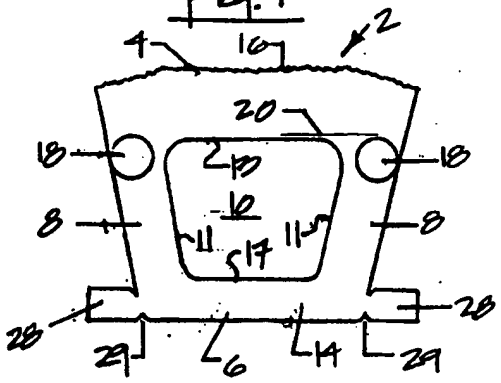


FIG. 2

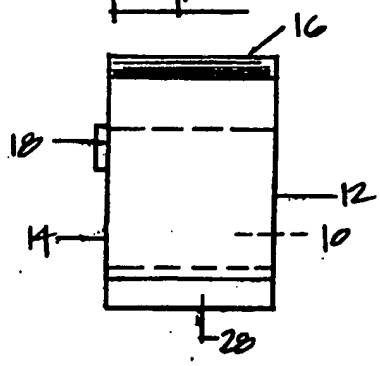


FIG. 3

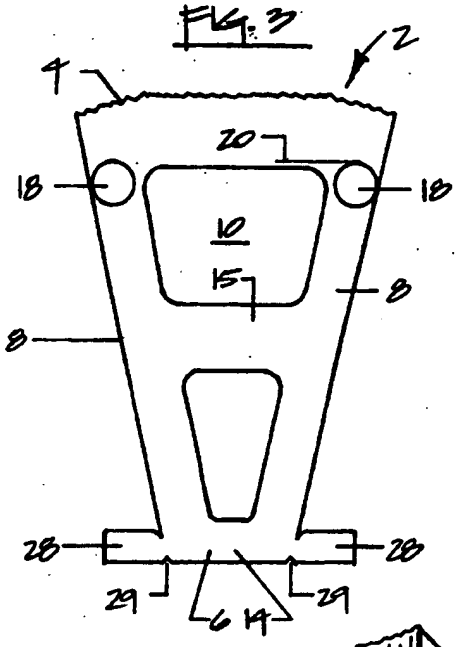


FIG. 4

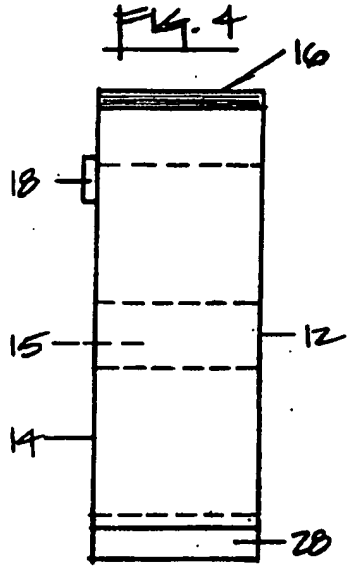


FIG. 5

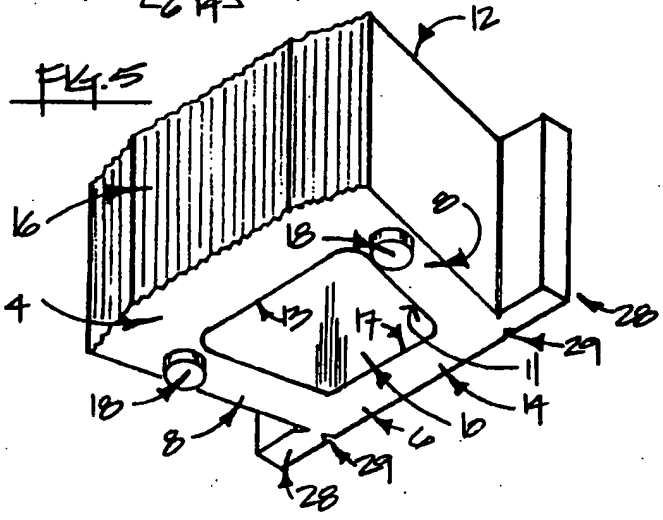


FIG. 6

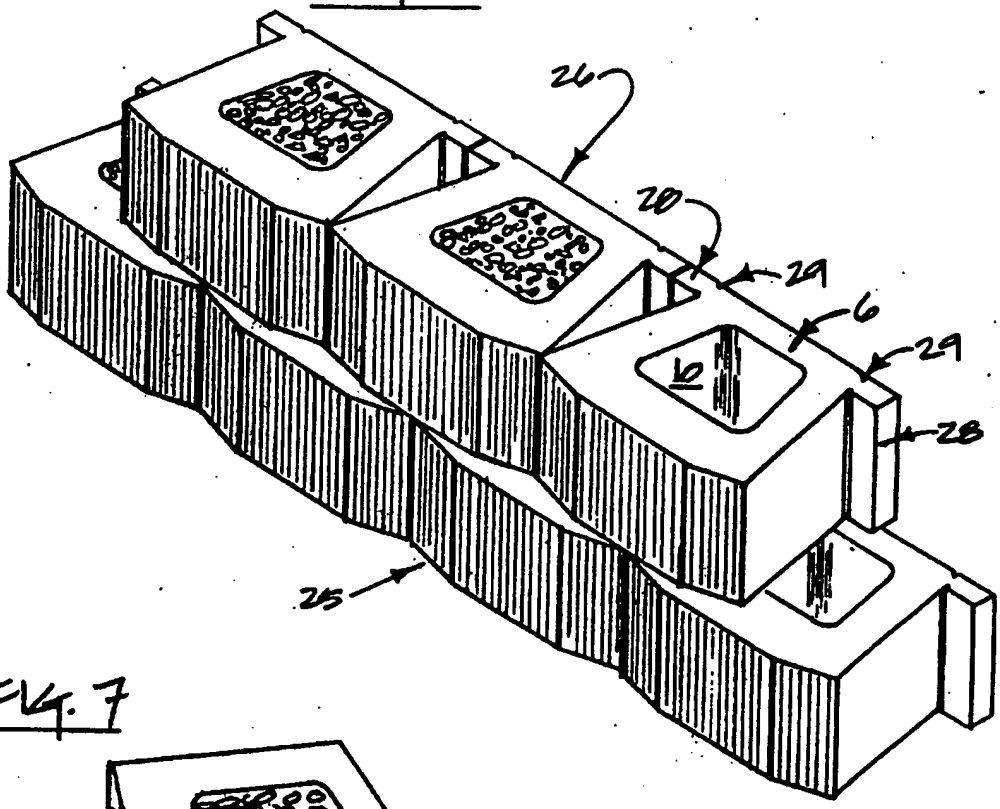


FIG. 7

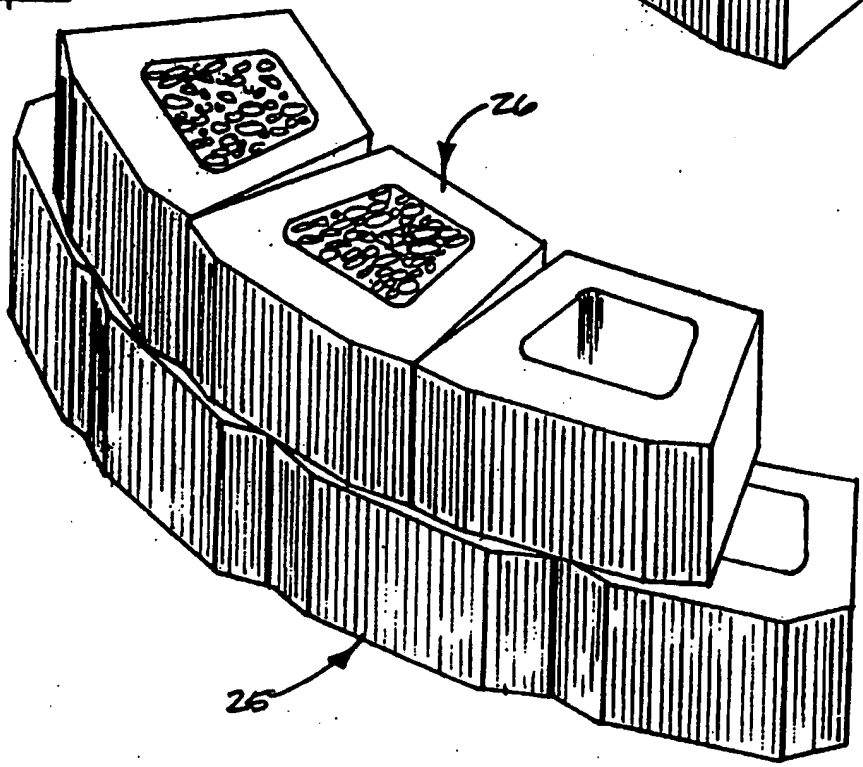


FIG. 8

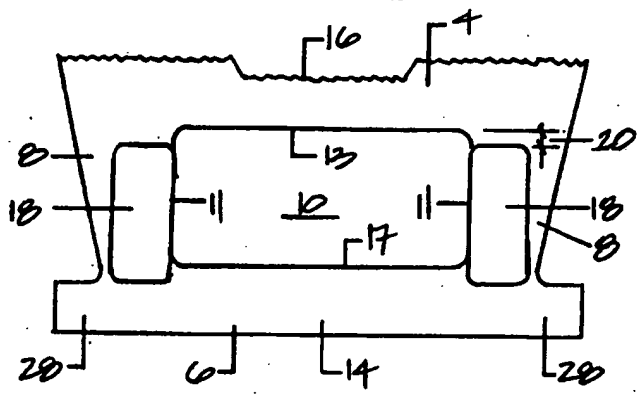


FIG. 9

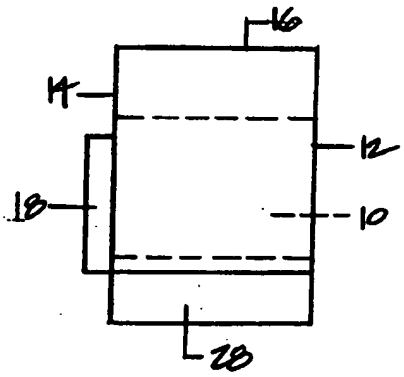
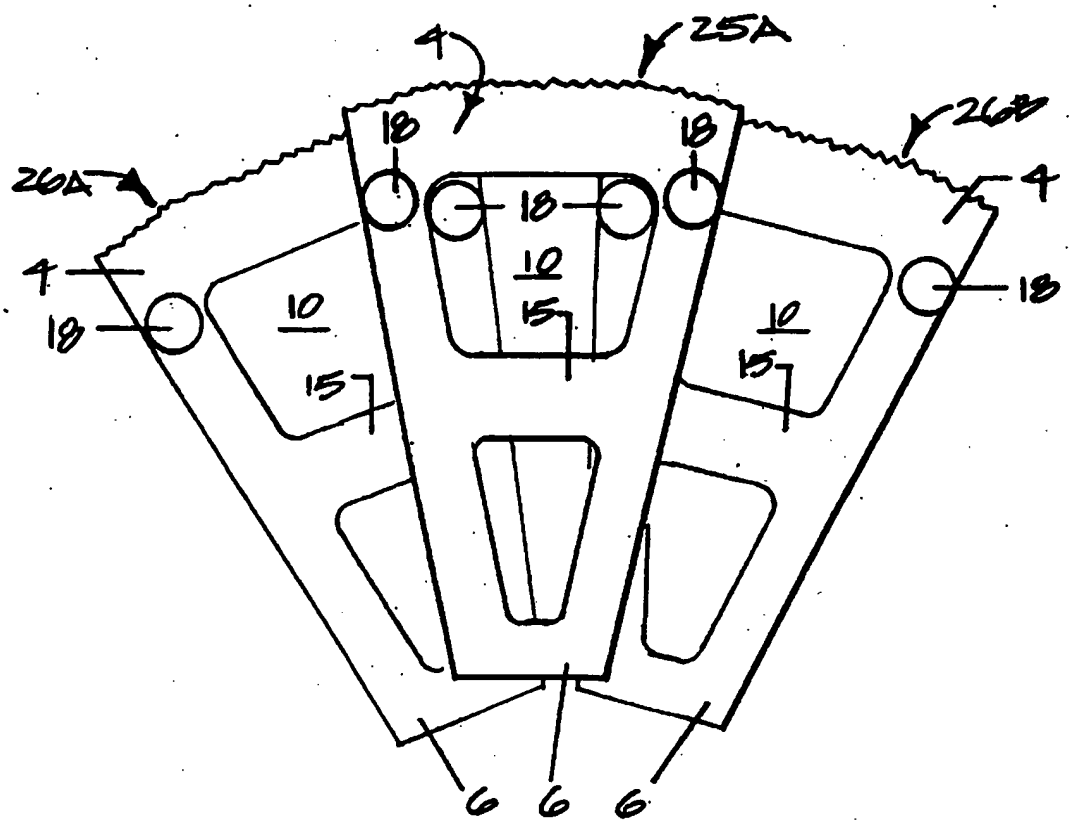


FIG. 10



RETAINING WALL BLOCK

FIELD OF THE INVENTION

This invention relates to a building block and a block wall construction.

BACKGROUND OF THE INVENTION

Retaining walls to prevent earth embankments from sliding and slumping are well known. Conventional walls are constructed from materials such as wood ties or blocks of stone or concrete. The rows of a wall are often offset with respect to one another to form a wall face that is inclined with respect to the vertical.

Retaining walls formed from interconnectable blocks are particularly popular as they are sturdy and relatively easy to construct. Many block designs and wall configurations have been developed. Examples of such designs are shown in the following patents:

U.S. Pat. 2,892,340 to Fort

U.S. Pat. 4,671,706 to Giardini

U.S. Pat. 4,825,619 to Forsberg

U.S. Pat. 4,860,505 to Bender

U.S. Pat. 4,920,712 to Dean, Jr.

U.S. Pat. 4,964,761 to Rossi

U.S. Pat. 4,965,979 to Larrivee et al.

U.S. Pat. 5,017,049 to Sievert

U.S. Pat. 5,044,834 to Janopaul, Jr.

U.S. Pat. 5,161,918 to Hodel

The wall blocks and wall constructions disclosed in the foregoing patents generally relate to blocks that use a system of drilled holes and aligning pegs or a tongue and groove arrangement to position and interlock together the individual blocks of the retaining wall.

Tongue and groove interlocking blocks suffer from the disadvantage that they are difficult if not impossible to form into a curved configuration without using specially shaped blocks. It is often necessary to have a curve in a retaining wall to accommodate curves in the terrain.

Blocks that use drilled holes and aligning pegs tend to be time consuming to interfit together. The additional cost of the aligning pegs and specially drilled holes in blocks makes the blocks more expensive to manufacture. The result is a retaining wall that is costlier to construct in terms of both time and materials.

SUMMARY OF THE INVENTION

The present invention provides a wall block that addresses the foregoing disadvantages of the prior art. The wall blocks of the present invention can be quickly and efficiently assembled into a straight or curved retaining wall using a single block design.

Accordingly, the present invention provides a block for forming a retaining wall comprising:

a generally parallelepiped body with front, rear, top, bottom and side surfaces and a central internal cavity with internal walls;

projecting means integrally formed on the bottom surface adjacent the front surface and positioned for protruding into the central cavity of at least one other block in a wall formed from the blocks, the projecting means being engagable against the internal walls of the open cavity to position the block in the retaining wall.

In a further aspect, the present invention provides a retaining wall comprising:

a lower tier of individual blocks arranged side by side, each block having a body with an internal cavity having internal walls;

an upper tier of individual blocks arranged side by side, each block having integrally formed projecting means formed on a lower surface of the block;

the upper tier being positioned on top of the lower tier with the projecting means of the upper tier being inserted within corresponding internal cavities of the lower tier to abut an internal wall of the cavities thereby positioning the blocks of the upper and lower tiers with respect to each other, the projecting means and the internal cavity being dimensioned and positioned such that the blocks of the upper tier are offset rearwardly and laterally from the blocks of the lower tier.

BRIEF DESCRIPTION OF THE DRAWINGS

Aspects of the present invention are illustrated, merely by way of example, in the accompanying drawings, in which:

FIG. 1 is a plan view of a block according to the present invention;

FIG. 2 is a side elevation view of the block of FIG. 1;

FIG. 3 is a plan view of a second embodiment of the block of the present invention;

FIG. 4 is a side elevation view of the block of FIG. 3;

FIG. 5 is a perspective view of the block of FIG. 1 and 2;

FIG. 6 is a perspective view of a straight retaining wall constructed using the blocks of FIG. 1 and 2;

FIG. 7 is a perspective view of a curved retaining wall constructed using the blocks of FIG. 1; and

FIG. 8 is a plan view of a third embodiment of the block of the present invention;

FIG. 9 is a side elevation view of the block of FIG. 8, and

FIG. 10 is a plan view of a section of a wall constructed from the blocks of FIG. 3.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIGS. 1, 2 and 5 illustrate a first embodiment of a block 2 for forming a retaining wall. The block includes spaced front and rear wall portions 4 and 6, respectively. A pair of sidewalls 8 extend between and join the front and rear wall portions to define a central open cavity 10 through the block having internal side walls 11, internal front wall 13 and internal rear wall 17. The block has an upper surface 12 and a lower surface 14.

The block is preferably formed from concrete and the face of front wall portion 4 is formed with a roughened pattern 16. The block has a generally trapezoidal shape in plan view with the front wall portion 4 wider than the rear wall portion 6.

FIGS. 3 and 4 illustrate a second embodiment of the block having a greater overall length than the first embodiment. A reinforcing web 15 is provided between the sidewalls 8 at substantially mid-length along the sidewalls. An internal cavity 10 is formed between web 15 and the front wall portion 4. The blocks of FIGS. 3 and 4 are used in larger retaining walls as their additional size and mass allows them to support a greater bulk of soil.

The blocks of the present invention are filled with loose angular gravel and dirt poured into open cavities **10** once the blocks are assembled into a wall structure to anchor the wall in place. The gravel or dirt permits free drainage of water through the interior of the wall.

Both embodiments of the block are provided with projecting means in the form of a pair of spaced, cylindrical extensions or knobs **18**. Knobs **18** are integrally formed on the lower surface **14** of sidewalls **8** adjacent front wall portion **4**. Knobs **18** are positioned on lower surface **14** to protrude into the open cavity **10** of an underlying block when the blocks are stacked atop each other to form a retaining wall as illustrated in FIGS. **6** and **7**. Knobs **18** of an upper block are abutted against an internal side wall **11** and internal front wall **13** of a cavity **10** in a lower block to quickly position the blocks in a wall structure. Knobs **18** extend slightly ahead of cavity **10** by a distance **20** such that the front wall portion **4** of an upper block is offset rearwardly from the front wall portion of an underlying block when the blocks are stacked one atop the other. This is the case even when knob **18** is directly engaging internal front wall **13**. This offset distance can be increased by moving knob **18** toward internal rear wall **17**. In addition, it is necessary to laterally offset or stagger an upper block to stack it atop a pair of underlying blocks. This staggered block arrangement permits each knob **8** of the upper block to fit within the cavities **10** of two underlying blocks.

FIG. **6** illustrates a retaining wall constructed with the blocks of FIGS. **1**, **2** and **5**. A lower tier **25** of individual blocks **2** are arranged side by side. An upper tier **26** of blocks is positioned on top of lower tier **25** such that knobs **18** of the upper tier are inserted within corresponding internal cavities **10** of the lower tier to abut an internal wall **11** of the cavities thereby positioning the blocks of the upper and lower tiers with respect to each other. The blocks of the upper tier are offset rearwardly and laterally from the blocks of the lower tier.

A retaining wall constructed according to the foregoing description is formed from identical blocks **2**. The blocks can be arranged in a straight line as illustrated in FIG. **6**. FIG. **7** illustrates a retaining wall in which the blocks are arranged in an arcuate configuration. Rear wall portion **6** of the block includes frangible extensions **28** that extend beyond sidewalls **8**. Frangible extensions **28** can be broken off along pre-formed fault lines **29** so that each block is reduced to essentially an arcuate segment. Each block can then be rotated to a desired angle to form a curved retaining wall as shown in FIG. **7**. The rounded surface of knobs **18** accommodate any curve in the retaining wall while maintaining consistent rearward and lateral offset in relation to other blocks.

FIGS. **8** and **9** illustrate a third embodiment of the block of the present invention intended for forming straight retaining walls. The block of FIGS. **8** and **9** is formed with essentially rectangular knobs **18** that are dimensioned for a close fit between the front and rear walls **13** and **17**, respectively, of an essentially rectangular internal cavity **10** of another block. Rectangular knobs **18** are offset rearwardly from front wall portion **4** and behind the front wall **13** of internal cavity **10** unlike in the blocks of FIGS. **1** to **4** where knobs **18** extend forwardly of the cavity front wall. The result is that the blocks of FIG. **8** and **9** must be oriented such that the knobs **18** are on the uppermost surface in order to construct a wall that is inclined at an angle to the vertical into the material to be held back by the wall. This arrangement is preferred as it allows the user to see knobs **18** of a lower block when aligning an upper block cavity **10** over the close fitting knobs. Knobs **18** permit lateral adjustment of the blocks with respect to each other, however, forward or rearward movement of individual blocks is prevented.

FIG. **10** illustrates a plan section of a wall constructed from blocks of the embodiment illustrated in FIG. **3**. The projecting means **18** of upper tier blocks **26***a* and **26***b* are engageable against the internal walls of open cavity **10** of lower tier block **25***a*, where all frangible extensions **28** have been broken off.

Although the present invention has been described in some detail by way of example for purposes of clarity and understanding, it will be apparent that certain changes and modifications may be practised within the scope of the appended claims.

I claim:

1. A block for forming a retaining wall comprising:

a body with front, rear, top, bottom and side surfaces and a central cavity with internal walls;

projecting means integrally formed on the bottom surface adjacent the front surface and positioned for protruding into the central cavity of at least one other underlying block in a wall formed from the blocks, the projecting means being laterally offset from the cavity and forwardly offset by a distance from the cavity toward the front surface and having a rounded surface being engageable against the internal walls of the cavity of an underlying block to position the block in the retaining wall in offset relation to underlying blocks.

2. A block for forming a retaining wall comprising:

spaced front and rear wall portions;

a pair of sidewalls extending between and joining the front and rear wall portions to define a central cavity in the block, the cavity having internal walls;

the block having an upper surface and a lower surface;

projecting means integrally formed on the side walls adjacent the front wall portion and positioned for protruding into the central cavity of at least one other underlying block in a wall formed from the blocks, the projecting means being laterally offset from the cavity and forwardly offset by a distance from the central cavity toward the front wall portion and having one rounded surface being engageable against the internal walls of the cavity in an underlying block to position the block in offset relation to underlying blocks.

3. A block as claimed in claim **2** in which the block comprises a generally trapezoidal shape in plan view with the front wall portion wider than the rear wall portion and the pair of sidewalls extending therebetween.

4. A block as claimed in claim **3** in which the rear wall portion is formed with frangible extensions that extend beyond the side walls.

5. A block as claimed in claim **2** in which the projection means are positioned with respect to the sidewalls and the internal cavity such that the block is laterally offset in relation to an underlying block.

6. A retaining wall comprising;

a lower tier of individual blocks arranged side by side, each block of the lower tier having a body with an cavity having internal walls;

an upper tier of individual blocks arranged side by side, each block of the upper tier having a body with front, rear, and side surfaces and an cavity and having projecting means with one rounded surface being integrally formed on a lower surface of the upper tier block, the projecting means being laterally offset from the

cavity and forwardly offset by a distance from the cavity toward the front surface;

the upper tier blocks being positioned on top of the lower tier blocks with the projecting means of the upper tier being inserted within corresponding cavities, of the lower tier to abut an internal wall of the cavities, with projecting means of adjacent blocks of the upper tier being inserted into the same cavity of a block in the lower tier, thereby positioning the blocks of the upper and lower tiers with respect to each other, the projecting means and the cavity being dimensioned and positioned such that the blocks of the upper tier are offset rearwardly and laterally from the blocks of the lower tier.

7. A retaining wall as claimed in claim 6, wherein the internal cavities are filled with granular fill.

8. A retaining wall as claimed in claim 6 in which all the blocks are identical.

9. A retaining wall as claimed in claim 8, wherein the internal cavities are filled with granular fill.

10. A retaining walls as claimed in claim 6 in which the tiers are arranged in a straight configuration.

11. A retaining wall as claimed in claim 10, wherein the internal cavities are filled with granular fill.

12. A retaining wall as claimed in claim 6 in which the tiers are arranged in an arcuate configuration.

13. A retaining wall as claimed in claim 12, wherein the internal cavities are filled with granular fill.

14. A retaining wall as claimed in claim 6, in which said projecting means of each block of the upper tier is formed with a pair of extensions having a rounded surface, each extension being engaged within the cavity of a separate underlying block.

15. A retaining wall as claimed in claim 14, wherein the internal cavities are filled with granular fill.

16. A block for forming a retaining wall comprising:

spaced front and rear wall portions;

a pair of sidewalls extending between and joining the front and rear wall portions to define a central cavity in the block, the cavity having internal walls;

the block having an upper surface and a lower surface;

projecting means integrally formed on the side walls adjacent the front wall portion and positioned for protruding into the central cavity of at least one other underlying block in a wall formed from the blocks, the projecting means having one rounded surface and being engageable against the internal walls of the cavity in an underlying block to position the block in offset relation to underlying blocks, in which the projection means comprise a pair of cylindrical extensions formed on the lower surface of the block adjacent each sidewall.

17. The block of claim 16, wherein the projection means are positioned with respect to the sidewalls and the internal cavity such that the front wall portion of the block is offset rearwardly from the front wall portion of an underlying block.

* * * * *

US005941042A

United States Patent [19]

Dueck

[11] Patent Number: 5,941,042

[45] Date of Patent: Aug. 24, 1999

[54] GARDEN BLOCK

[75] Inventor: Vernon J. Dueck, Coquitlam, Canada

[73] Assignee: Pacific Precast Products Ltd., British Columbia, Canada

[21] Appl. No.: 08/895,426

[22] Filed: Jul. 16, 1997

[51] Int. Cl.[6] E04C 1/00

[52] U.S. Cl. 52/604; 52/603; 52/592.6; 52/589.1; 405/286

[58] Field of Search 52/604, 605, 606, 52/608, 592.6, 592.4; 405/284, 286

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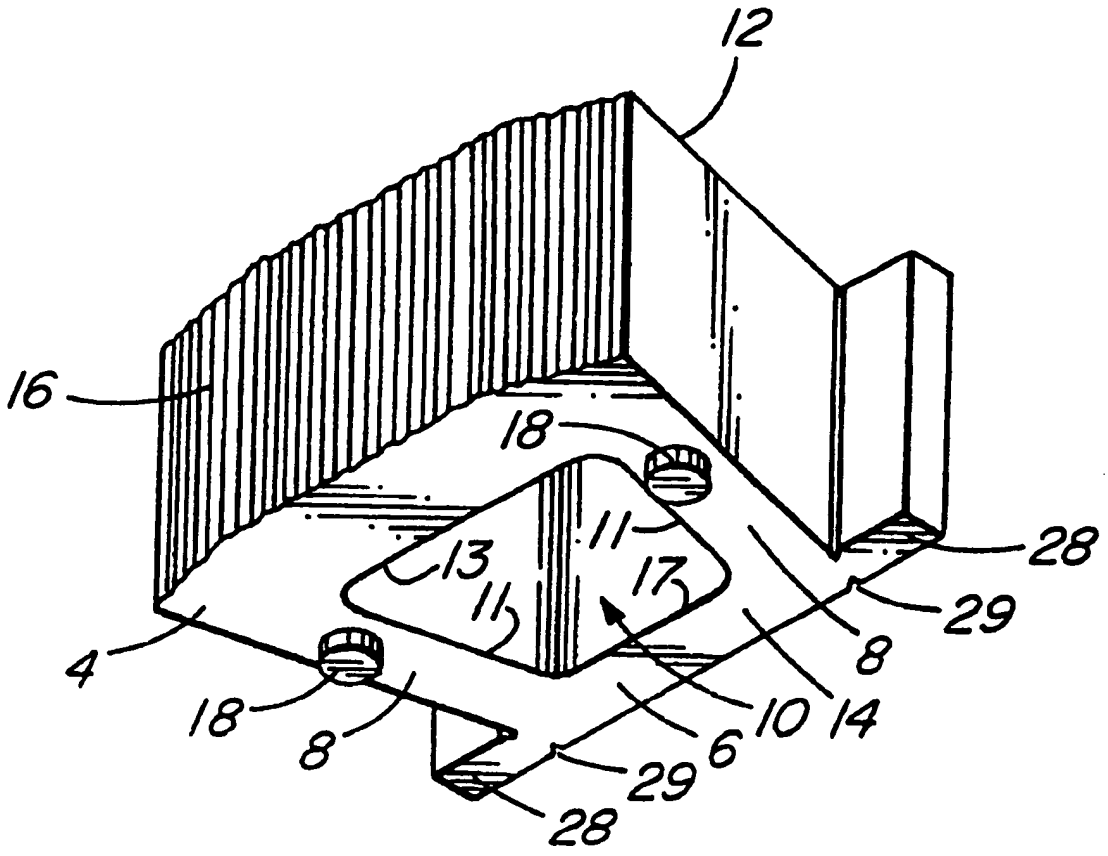
Primary Examiner—Carl D. Friedman
Assistant Examiner—Winnie S. Vip
Attorney, Agent, or Firm—Smith Patent Office

[57] ABSTRACT

A block useful for constructing retaining walls for gardens, has two bottom lugs or knobs, bracketing an internal cavity. The cavity may be filled with soil. In forming a wall, the upper row of blocks is rearwardly onset from the lower row of blocks, whereby the lugs of the blocks of the upper row abutting the back surfaces of the blocks of the lower row.

11 Claims, 2 Drawing Sheets



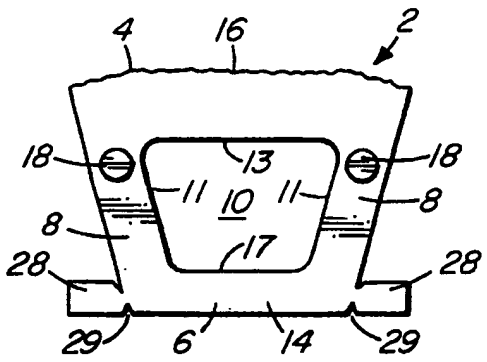


FIG. 1

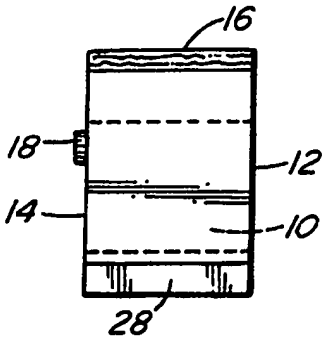


FIG. 2

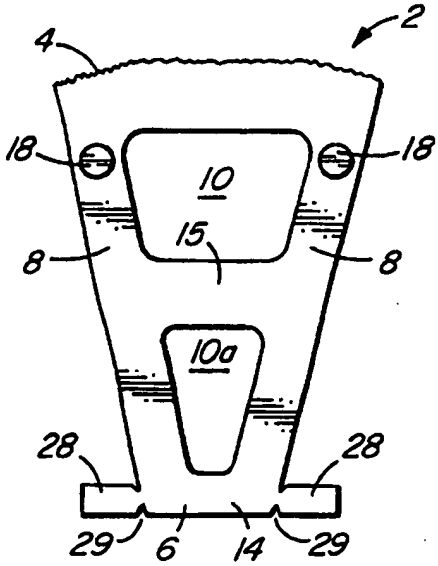


FIG. 3

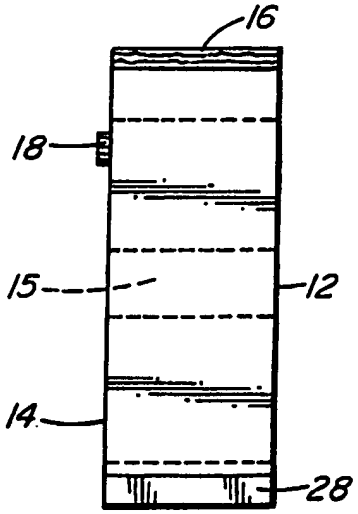


FIG. 4

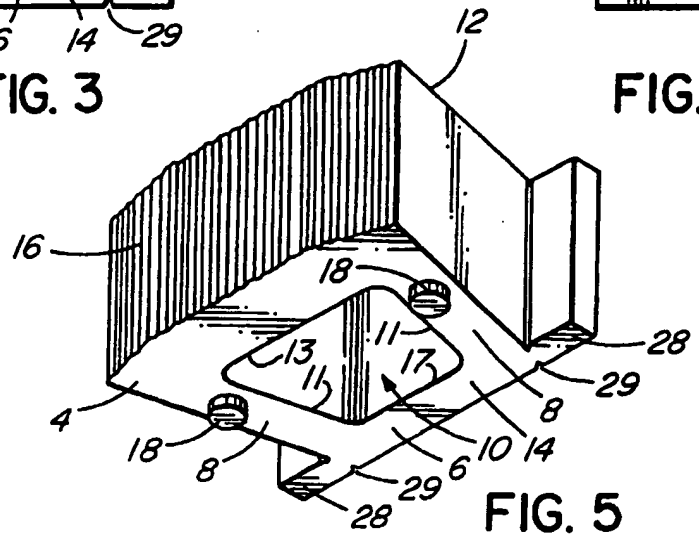


FIG. 5

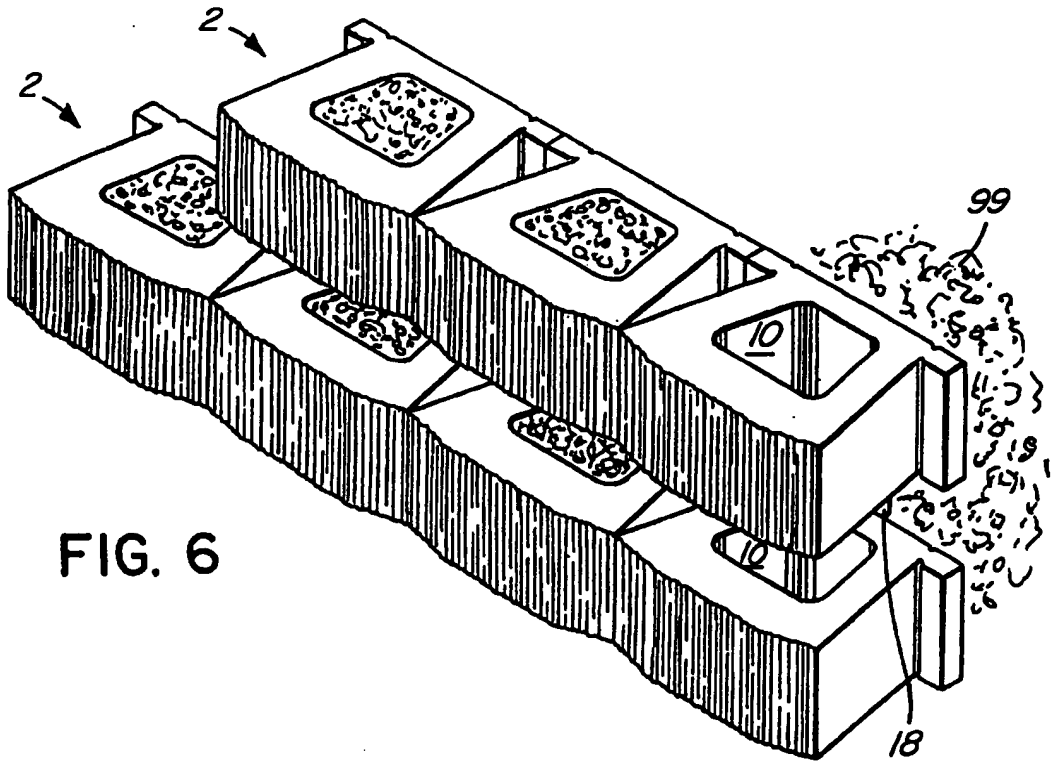


FIG. 6

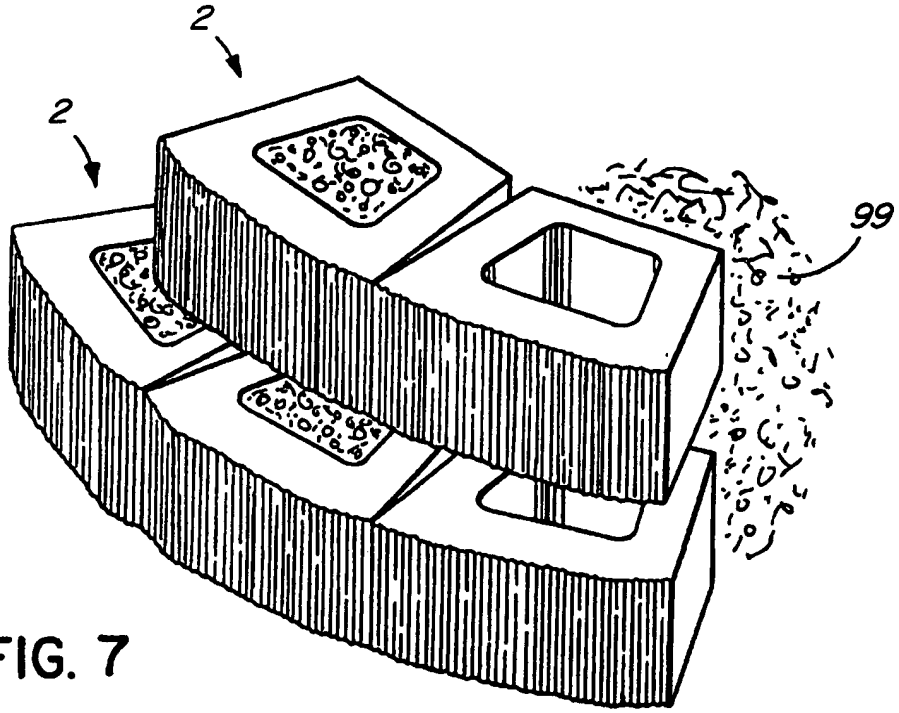


FIG. 7

GARDEN BLOCK

FIELD OF INVENTION

This invention relates to blocks and retaining walls suitable for gardens and other small non-construction sites.

BACKGROUND OF INVENTION

Small retaining walls for gardens and other sites of similar dimensions and requirements, are ideally constructed simply and with minimum equipment.

SUMMARY OF INVENTION

According to this invention, there is provided a block for forming a retaining wall comprising: (a) a body with front, rear, top, bottom and side surfaces and a central cavity with internal walls; (b) projecting means integrally formed on said bottom surface proximate said front surface and being laterally offset from said cavity and rearwardly offset from the front of the cavity and having a rounded front surface.

According to another aspect of this invention, there is provided a retaining wall comprising: (a) a lower row of blocks arranged side by side, each block having a body with a cavity and a rear surface; (b) an upper row of blocks arranged side by side, each block having a body with a cavity and projecting means integrally formed on said bottom surface, whereby said projecting means abut the rear surfaces of proximate block of the lower row.

BRIEF DESCRIPTION OF DRAWINGS

Advantages of the present invention will become apparent from the following detailed description taken in conjunction with preferred embodiments shown in the accompanying drawings, in which:

FIG. 1 is a plan view of a block according to the invention;

FIG. 2 is a side view of the block of FIG. 1;

FIG. 3 is a plan view of a second embodiment of the block of the invention;

FIG. 4 is a side view of the block of FIG. 3;

FIG. 5 is a perspective view of the block of FIGS. 1 and 2;

FIG. 6 is a perspective view of a wall formed of the block of FIG. 5; and

FIG. 7 is a perspective view of a variation of the wall of FIG. 6.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIGS. 1, 2 and 5 show a first embodiment of a block 2 for forming a retaining wall. Block 2 includes spaced front and rear wall portions 4 and 6 respectively. A pair of side walls 8 extend between and join the front and rear wall portions to define a central open cavity 10 through the block having internal side walls 11, internal front wall 13 and internal rear wall 17. The block has upper surface 12 and a lower surface 14. Block 2 is preferably formed from concrete and the face of front wall portion 4 is formed with a roughened pattern 16. Block 2 has a generally trapezoidal shape in plan view with the wall portion 4 wider than the rear wall portion 6.

Rear wall portion 6 of block 2 includes a frangible extension 28 that extends beyond sidewalls 8. Extensions 28 can be broken off along pre-formed fault lines 29 (e.g. by a hammer) so that block 2 is reduced to essentially an arcuate segment. Such a block 2 can then be rotated to a desired angle to form a curved retaining wall, as shown in FIG. 7 described below.

Block 2 is provided with projecting means in the form of a pair of spaced, cylindrical extensions or knobs 18. Knobs 18 are integrally formed on the lower surface 14 of side walls 8 behind the front edge of cavity 18. Although knob 18 is shown to be cylindrical, it need only have a front curved surface to be able to rotate and accommodate a desired curved configuration of retaining wall, or could have a flat front surface if non-curved configurations are sufficient. Although knob 18 is shown to be positioned proximate the front edge of cavity 18, knob 18 can be positioned farther rearwardly. The extent that knob 18 is positioned behind the front edge of cavity 18 determines the rearward offset of the wall constructed, as described below.

FIGS. 6 and 7 show retaining walls constructed with the foregoing described first embodiment of blocks 2. A first row of blocks 2 is laid on the ground or in a shallow trench dug in the ground. Blocks 2 are backfilled with soil 99 and cavities 10 are filled with soil or loose angular gravel and dirt, to anchor the row of blocks 2, to permit drainage of water therethrough, and to permit plants and flowers to be planted therein. After completion of the first row and backfilling as described, a second row of blocks 2 is laid. The blocks 2 of the second row are laterally offset from the blocks 2 of the first row. In particular, a block 2 of the second row is positioned in approximately half bond relationship to two underjacent blocks 2 of the first row (i.e. the upper block 2 is centered approximately at the plane of contact between the two underjacent blocks 2. The two knobs 18 of a block 2 of the second row abut the respective rear wall portions 6 of the two adjacent blocks 2 of the first row. One such abutment of knob 18 is shown in FIG. 6. Thus formed, the second row of blocks 2 are rearwardly offset from the first row of blocks 2. Then the blocks 2 of the second row are backfilled and filled, and the above process is continued for perhaps several more rows for a common garden setting.

FIG. 7 shows an arcuate wall of blocks 2 where the frangible extensions 28 have been removed.

FIGS. 3 and 4 show a second embodiment of block 2 having generally larger dimensions than those of the first embodiment. A reinforcing web 15 is provided between side walls 8 at substantially mid-length therealong to form front and rear internal cavities 10 and 10*a*. The blocks of FIGS. 3 and 4 are used for larger retaining walls because their additional size and mass allows them to support a greater bulk of soil. The method of creating retaining walls described above for the first embodiment of block 2, is applied to the second embodiment of block 2. One variation (not shown) is that knobs 18 may abut the rear wall portion 6 or be inserted into rear internal cavity 10*a* and abut a front surface thereof, thus allowing a variation in the rearwardly offset of superjacent rows of blocks 2. In contrast, a wall employing the first embodiment of block 2 will have a uniform rearwardly offset between superjacent rows.

Typical dimensions of the fist embodiment of block 2 are 4" high by 12" wide by 8" deep with knobs 0.5" high and 2.5" in diameter if the knob is cylindrical. It will be appreciated that the dimensions given are merely for purposes of illustration and are not limiting in any way. The specific dimensions given may be varied in practising this invention, depending on the specific application.

While the principles of the invention have now been made clear in the illustrated embodiments, there will be immediately obvious to those skilled in the art, many modifications

of structure, arrangements, proportions, the elements, materials and components used in the practice of the invention, and otherwise, which are particularly adapted for specific environments and operational requirements without departing from those principles. The claims are therefore intended to cover and embrace such modifications within the limits only of the true spirit and scope of the invention.

What is claimed is:

1. A retaining wall comprising:

(a) a lower row of blocks arranged side by side, each block having a body with a cavity and a rear portion;

(b) an upper row of blocks arranged side by side, each block having a body with a front, rear and bottom portion, two side portions and a central cavity with a front internal wall and projecting means integrally formed on said bottom portion between a plane containing said front internal wall and a plane containing a rear internal wall of the central cavity, said projecting means being laterally, outwardly and rearwardly offset from said cavity front internal wall and having a rounded front surface, wherein said projecting means abuts said rear portion of a proximate block in the lower row and said front, rear, top, bottom and side portions being rearwardly offset in relation to the proximate block in the lower row.

2. A retaining wall as claimed in claim 1, wherein the cavities are filled with granular fill.

3. A retaining wall as claimed in claim 1, wherein all the blocks in said upper row are identical.

4. A retaining wall as claimed in claim 3, wherein the cavities are filled with granular fill.

5. A retaining wall as claimed in claim 1, wherein the rows of blocks are arranged in a straight configuration.

6. A retaining wall as claimed in claim 5, wherein the cavities are filled with granular fill.

7. A retaining wall as claimed in claim 1, wherein said rear portion comprises a frangible extension that extends parallel to said rear portion.

8. A retaining wall as claimed in claim 1, wherein one block in said upper row has the frangible portion of the one block removed and the one block is disposed relative to its adjacent block in that said upper row so that the corresponding portion of the wall defined by said two blocks, is partially arcuate.

9. A retaining wall as claimed in claim 1, wherein the cavities are filled with granular fill.

10. A retaining wall comprising:

(a) a lower row of blocks arranged side by side, each block having a body with a cavity and a rear portion;

(b) an upper row of blocks arranged side by side, wherein each block in said upper row comprising a body with a front, rear and bottom portion, two side portions, a front cavity with a front internal wall and a rear cavity with a rear internal wall and projecting means integrally formed on said bottom portion between a plane containing said front internal wall of said front cavity and a plane containing said rear internal wall of the rear cavity, said projecting means being laterally, outwardly and rearwardly offset from said cavity front internal wall and having a rounded front surface, wherein said projecting means abuts said rear portion of a proximate block in the lower row and said front, rear, top, bottom and side portions being rearwardly offset in relation to the proximate block in the lower row.

11. A retaining wall as claimed in claim 10, wherein the cavities are filled with granular fill.

* * * * *

United States Patent [19]

Gravier

[11] **Patent Number: 4,909,010**

[45] **Date of Patent: Mar. 20, 1990**

[54] **CONCRETE BLOCK FOR RETAINING WALLS**

[75] Inventor: **Robert A. Gravier, Bloomington, Minn.**

[73] Assignee: **Allan Block Corporation, Edina, Minn.**

[21] Appl. No.: **134,104**

[22] Filed: **Dec. 17, 1987**

[51] **Int. Cl.**[4] **E04C 1/12; E02B 3/12; E02D 17/20**

[52] **U.S. Cl.** **52/609; 405/284**

[58] **Field of Search** 52/604–611, 52/437, 596, 597; 405/273, 284–287

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Primary Examiner—James L. Ridgill, Jr.

Attorney, Agent, or Firm—James R. Cwayna

[57] **ABSTRACT**

A concrete block particularly directed to the construction of retaining wall systems, characterized particularly by a step back frontal surface which includes a frontal surface having a flat decoratable portion over a substantial vertical dimension thereof and tapered rearwardly and vertically from such frontal surface to a top planar surface with an interlock area behind such surface to receive additional blocks thereon to create a wall. This interlock area provides a flat planar block locating surface for the positioning of a next vertical block and when the blocks are arranged in vertical relation on top of one another a step back frontal surface is provided. Combination drainage and tie-back anchor apertures are provided in the rear vertical surface of the block. The block includes weight reducing passages vertically therethrough which also accommodate vertical tiers. The block may include rearwardly and inwardly directed sides such that adjacent blocks are joinable to form a curved frontal surface of the constructed wall. The interlock of the blocks creates a strong barrier wall which affords an artistically conceived frontal surface. The design of the blocks provides for a vertical and horizontal tying of the blocks through reinforcing bars or other means.

9 Claims, 2 Drawing Sheets

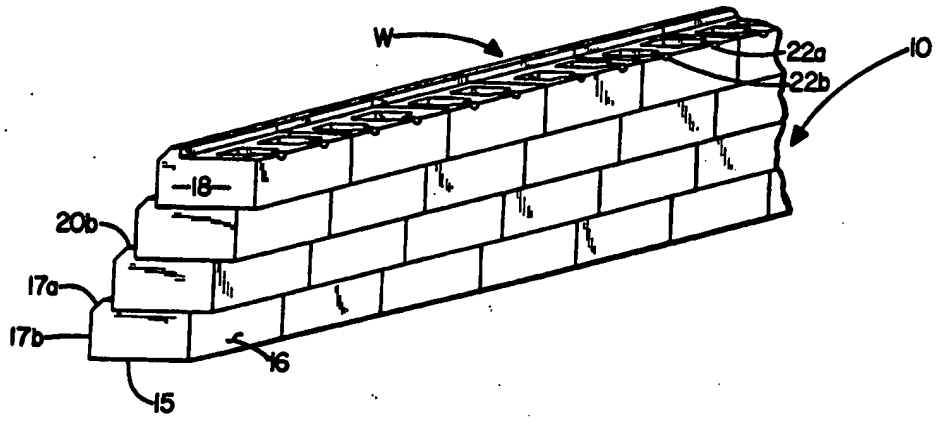
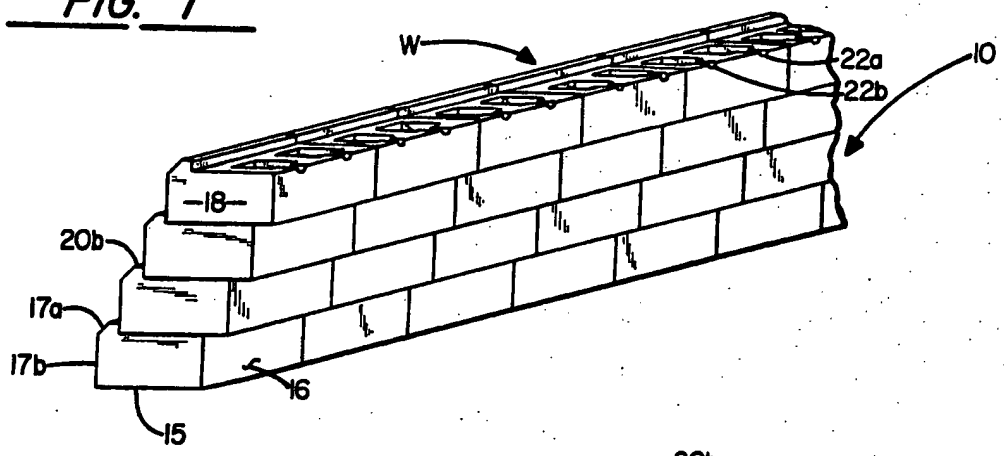


FIG. 1



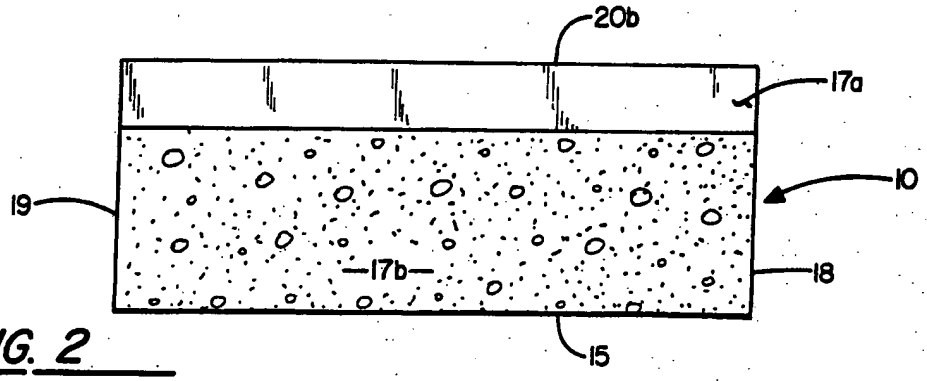


FIG. 2

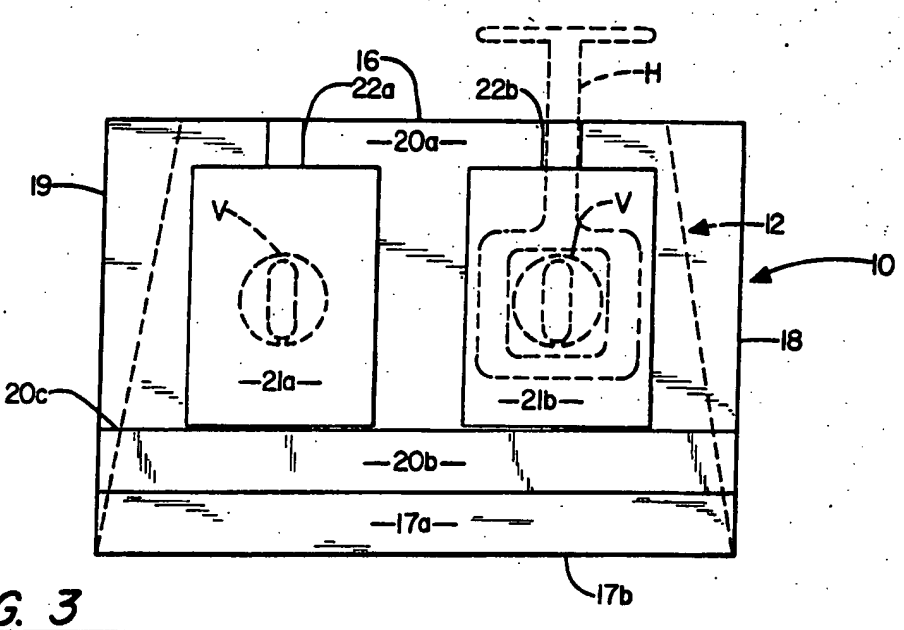


FIG. 3

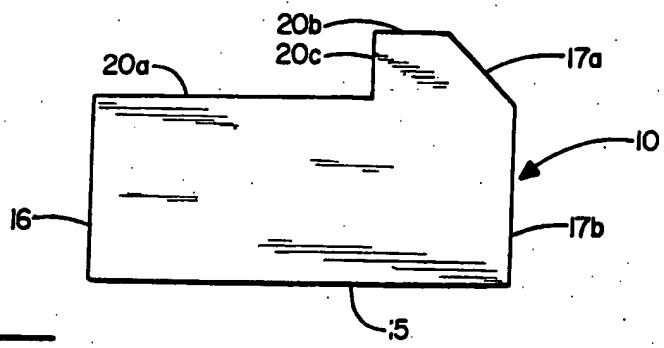


FIG. 4

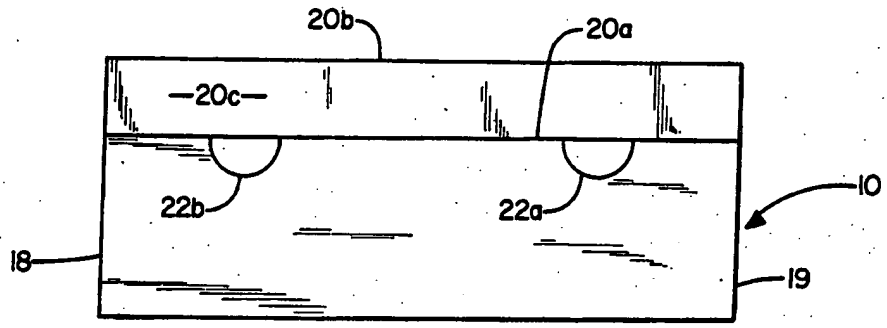


FIG. 5

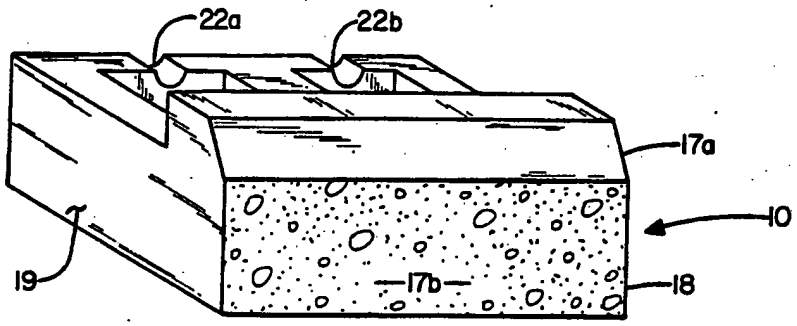


FIG. 6

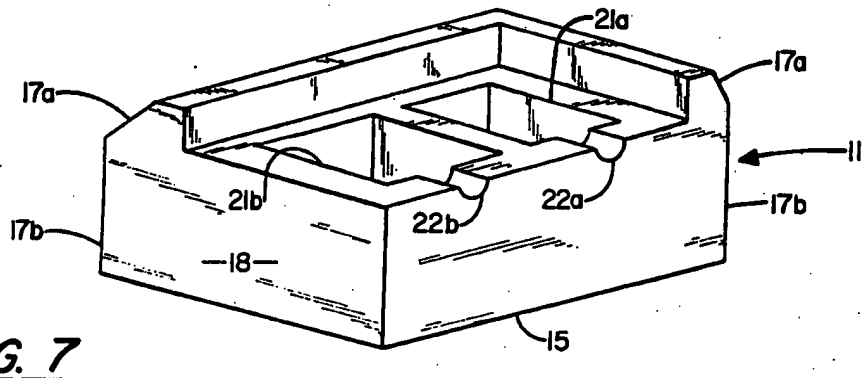


FIG. 7

CONCRETE BLOCK FOR RETAINING WALLS

FIELD OF THE INVENTION

This invention relates generally to concrete block structures and particularly to a concrete block joinder system for erection of retaining walls without mortar and which provides for an interlock of the blocks such that the resulting wall provides an inclined support and earth barrier.

SHORT SUMMARY OF THE INVENTION

This invention relates to a concrete block as the basis for a system for building of retaining walls and the like. The block is characterized by a generally flat rectangular surface for placement onto the ground or other bearing foundation and for placement onto lower blocks in erecting the wall. The block is further characterized by a frontal flat or decoratable surface having a rearwardly and upwardly directed upper portion terminating in a flat planar top with this frontal portion defining a rearwardly positioned notch and next block locating area. The upper surface of the block defines the locating portion as being a flat surface with a vertical ledge formed by a frontal, rearwardly directed portion such that blocks may be placed on top of one another and when so placed, an inclined front decorative surface is provided with an upper block interlocking with the next lower block. Applicant's block also incorporates weight reduction passages vertically therethrough which permit the insertion of vertical connecting rods between vertically adjacent tiers or rows of such blocks. In addition to the lightening apertures a rearwardly extending passage is formed through the rear vertical surface of the block to permit the installation of earth tie-bars into the block. The vertical and rearward connecting means may be combined. These rear apertures also serve as weep holes or drainage holes to permit water to drain from the interior of the block should water accumulate within the erected wall.

Applicant's block for a complete wall system may take several configurations with a first unit being a straight line block for the erection of straight walls with a second version providing rearwardly and inwardly directed sides such that adjacent blocks within any given row or tier, when abutted in side-by-side relation will form a curved surface to the frontal exposed wall area. Another version of the block includes corner elements where the inwardly and upwardly directed frontal surface is provided on at least the front and one adjacent side of the block. This version permits corner construction and continuance of the decorative front area about and around corners of various angles.

When completed, a retaining wall formed from the blocks embodying the applicant's concept provides an inclined frontal surface and an inclined rear surface matching the frontal surface with the frontal surface providing a decorative and artistic arrangement.

BACKGROUND AND OBJECTS OF THE INVENTION

Applicant is aware of many commercially available concrete blocks for the construction of retaining walls and the like. In reviewing the commercially available art he has not found any block which incorporates the advantages and interlocking abilities as contained herein.

Applicant has also searched the applicable patented art and has found the following listed U.S. Patents: Heinzmann, No. 4,229,123; Schmitt, No. 2,313,363; Clarke, No. 4,081,969; Fisher, No. 3,282,056; Upson, No. 982,697; and Perada, No. 4,426,176.

Of this prior patented art it would appear that only the Heinzmann and Schmitt patents include the concept of a seating and interlock area for the joinder and connection of vertically adjacent rows or tiers of blocks.

The Schmitt patent utilizes the interlocking edge on the rear downwardly depending corner of the blocks such that an upper block will have a downwardly depending side to abut against the top of a lower tier of blocks. This structure then provides a frontal surface which is entirely flat and which may be, as illustrated in Schmitt, decorated in various forms to similate brick or stone structures.

The Heinzmann patent illustrates a block to provide a support surface and a front locking surface for the next vertically adjacent row of blocks. The unit also provides for inversion of rows of blocks wherein this capturing lip or notch may be positioned in downwardly extending location over the rear of a lower tier of blocks. The Heinzmann patent does not consider frontal decorative situations and only provides a flat front surface which, when a wall is erected provides a series of straight, stepped elements. Heinzmann embraces the concept of "loose tiers" and strongly suggests horizontal spacing between tiers to allow for plant growth. Heinzmann does not allow for either vertical or horizontal tie-in and does not consider drainage from behind the wall and into the wall. Obviously, suitable material to sustain plant growth must be provided within the openings provided by the horizontal spacing of the blocks. This is a secondary operation. The final objective of the Heinzmann patent is to provide a "living wall" in direct controversy to the concept of the applicant's device.

None of these patents provide a decorative effect as obtained through the tapered, decoratable forward surface provided by applicant and none of these patents consider the utilization of tie bar accommodations such that the constructed wall may be tied both vertically and into the earth to be retained. In addition, none of these patents are concerned with the alleviation of water that may accumulate interiorly of the blocks.

It is therefore an object of the applicant's invention to provide a concrete retaining block unit for retaining walls which provides an interlock between vertically adjacent tiers of the blocks in constructing the wall.

It is a further object of the applicant's invention to provide a concrete block for the construction of retaining walls and the like which includes a frontal surface having an inwardly and upwardly directed portion at the upper edge of the frontal surface to provide a decorative frontal arc and having a flat receiving surface therebehind to receive the next vertically adjacent block thereon and interlock the same to provide a rearwardly directed and inclined frontal surface for the constructed wall.

It is a further object of the applicant's invention to provide an interlocking concrete block structure having weight reducing apertures arranged vertically therethrough which will also permit the passage of vertical tie bars between blocks and having a rear aperture therethrough designed for drainage of water from the interior of the blocks and also provide for a dual operation of tie bar installation wherein a tie bar may be

inserted into the soil behind the wall and connect the wall thereto and further providing for interconnection of both tie bars.

It is a further object of the applicant's invention to provide a concrete block as the basis for a retaining wall system which includes a block specific to corner installation.

It is a further object of the applicant's invention to provide a method for manufacture of retaining wall blocks which includes molding of two blocks in face-to-face relation and splitting the blocks to provide a decorative surface to a front surface of the block.

SHORT DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view taken from the rear side of a retaining wall constructed from concrete blocks embodying the concepts of the applicant's invention;

FIG. 2 is a front elevation view of the blocks;

FIG. 3 is a top plan view of the blocks, including, in phantom lines, a horizontal and a vertical tie back;

FIG. 4 is a side elevation thereof;

FIG. 5 is a rear elevation thereof;

FIG. 6 is a front perspective of the applicant's block; and

FIG. 7 is a rear perspective view of a block embodying the applicant's concepts and provided for corner installation.

DESCRIPTION OF A PREFERRED FORM OF THE INVENTION

In accordance with the accompanying drawings the concrete block as the basis for a retaining wall system embodying the concepts of the applicant's invention is generally designated 10. A modified form of the block particularly adapting the same for corner installations is generally designated 11 as illustrated in FIG. 7 and this form will be described after the description of the first, what may be termed straight line form of the invention. Another modification of the block 10 is shown by the dotted line configuration of FIG. 3 and this form will be described hereinafter and is designated 12.

A typical wall section as constructed from a plurality of the straight line blocks 10 is illustrated in FIG. 1. The wall W, as illustrated in FIG. 1, shows the interlocking arrangement for the blocks 10 particularly to show the inclined frontal surface and inclined rearward surface of the completed wall W.

The block 10 is generally rectangular in shape and of a predetermined height and, as best illustrated in the side elevation of FIG. 4 includes a bottom surface 15, a rear side 16, a frontal surface consisting of a rearwardly and upwardly directed portion 17*a* and a vertical portion 17*b* and end surfaces 18–19 in normal arrangement to the frontal surface 17*b* or which may be angularly arranged thereto as will be further described with consideration of form 12. The uppermost surface of all forms of the block 10, 11 and 12 is divided into two distinct areas designated respectively 20*a*–20*b* with a vertical dividing shoulder 20*c* arranged therebetween. The area defined by a flat top surface 20*a* with vertical shoulder 20*c* provides an interlock area for the next vertically oriented block received thereon.

As particularly illustrated in FIG. 3 lightening or weight reduction passages 21*a*–21*b* are provided vertically through the block 10 and a pair of apertures or passages 22*a*–22*b* communicate with such passages 21*a*–21*b* through surface 20*a* to define a passage from the weight reducing areas 21*a*–21*b* through the rearmost surface 16 of the block. The block 10 then provides a primary support base 15 which is positioned on the ground or other foundation surface with the next vertically oriented tier of blocks being arranged in the interlocking area formed by the surfaces of the top 20*a*, 20*b* and 20c. In this particular arrangement it should be obvious that the weight reducing passages 21*a*–21*b* of several vertically oriented blocks will be in general alignment for either filling of the same with dirt or other materials or for the insertion of vertical tie elements such as re-bars or the like. These apertures 21*a*–21*b* then perform a dual function in initial weight reduction of the block for ease of handling thereof and ultimate filling thereof or tying of vertically oriented blocks to one another.

Apertures 22*a*–22*b* passing from the weight reducing passages 21*a*–21*b* through the rear surface of the block serve a dual function. These apertures or passages or channels 22*a*–22*b* serve as fluid or water relief holes for the drainage of any accumulated water from the interior of the formed wall into the adjoining dirt or alternatively form a channel into which an anchor may be placed for tying the entire formed wall into the adjoining dirt which is to be retained. Such tie-bars are normally referred to as dead heads and many forms of anchoring devices are available and the channels 22*a*–22*b* accommodate the various tie in units.

FIG. 3 illustrates the utilization of vertical V and horizontal H tie bars which aid in maintaining vertical alignment of the blocks 10 and tie-in of the completed wall system into the earth to be retained. These articles V, H are illustrated in phantom lines as being suggestive of tie-in utilization. As illustrated in FIG. 3, a vertical tie bar V may pass through aligned apertures 21*a*–21*b* of the block 10 or, as illustrated in the right aperture 21*b* of the block 10 the vertical V tie bars may be interconnected with a horizontal H tie bar with the tie bar H having a receiving aperture formed on one end thereof. Such tie bars are readily available in the art. In the combinative effect as illustrated in the passage 21*b* the vertical tie V passes through the aperture in the horizontal tie H for the desired combined vertical and horizontal tie situation. Obviously the horizontal tie H may take many forms and is commonly known as a "dead head" member. This particular combinative useage is only available with a block having the vertical passages 21*a*–21*b* and the combined drainage tie bar passages 22*a*–22*b*.

The frontal surface 17 of the block, consisting of the upwardly and rearwardly defined surface 17*a* and vertical surface 17*b* provides a decorative effect to the block and further reduces the possible area of accumulation of material on the frontal and upper surface of the block. In the prior art situations blocks that provide such an upper interlock surface also provide a flat ledge upon which debris, dirt, water and the like may accumulate. By providing the sloped surface 17*a* a more pleasing decorative effect is obtained and the accumulation area is substantially decreased.

Applicant's method of molding the individual blocks 10 results in a new method of manufacture to obtain a particular decorative surface on the vertical section 17*b* of the frontal area 17 of the block 10. Two blocks are molded as a single unit with the surfaces 17*b* being formed after molding. Obviously in a molded two part unit the tapered surfaces 17*a* of two facing blocks provides a "splitting" channel. Simply cracking the blocks along the meeting surfaces of the tapered portion 17*a*

results in the blocks splitting to form surface 17*b*. The result of such splitting will provide an open aggregate surface and thus a decorative surface for each of the molded blocks. It is felt that this method for providing the frontal decorative surface is unique in the art as most exposed aggregate surfaces are obtained either through sandblasting or exposed aggregate molding techniques.

It should be obvious that a retaining wall utilizing a straight line block simply requires the forming of a foundation surface for the lower block and placing the blocks in a single tier in a side by side relation with the next tier of blocks being positioned in the receiving notch area of the block 10.

In order to form a curved front surface the sides 18–19 may be directed to converge inwardly as illustrated by the dotted line configuration, designated 12 in FIG. 3. Obviously this same modification could be provided to include sides 18–19 which would converge in a forward direction such that curvalinear effects of both convex and concave design would be attainable. This requires a slight modification from the normal side elements in the straight line arrangement.

A further modification of the applicant's unit is designated 11 and illustrated in FIG. 7. In this form of the invention the frontal beveled surface 17*a* is provided on two surfaces of the block such that a corner effect is attained. As illustrated in FIG. 7, on such a block, there are two frontal vertical surfaces 17*b* arranged at right or a selected angle to each other with the inwardly directed surfaces 17*a* accommodating this same angularity. Obviously this corner configuration could be provided for both a right and left hand corner.

It should be obvious that the applicant's block has certain unique features and serves as an element in a system for the construction of retaining walls. The straight line configuration permits simple straight walls with the combination of the corner elements permitting continuation of the wall about corners while the converging and diverging side structures permit the construction of curvalinear walls. The tie, both vertical and horizontal, provide for positive joinder of the blocks 10 not only to one another but also to the earth to be retained. The combinative effect of the vertical and horizontal ties offers a very positive method for vertical and horizontal tying of a completed wall. The horizontal channels through the rear of the blocks 10 into the vertical passages of the blocks provides means for draining water from the retained earth. The cause of wall collapse is very often the accumulation of water behind the wall and with this structure drainage of such water is achieved.

Use of the applicant's block should be obvious and the interlocking, interconnecting thereof should similarly be obvious. The various dimensions of the block may be modified to any configuration without departing from the scope of the invention.

What I claim is:

1. A concrete block for use in construction of retaining walls and the like, said block including:

a. bottom, top, rear, side and frontal surfaces,

b. said bottom, rear and side surfaces being generally planar and arranged generally normal to one another;

c. said top including a first support area defined over a predetermined area of said top for the support of additional blocks, a vertically extending shoulder adjacent said frontal surface of said block and extending entirely therealong to provide a continuous block positioning member in close association to said frontal surface and a second top surface at the uppermost end of said extending shoulder;

d. said frontal surface defining a lower vertical portion normal to said bottom and an upper, rearwardly inclined portion extending from said vertical portion terminating at said second top surface;

e. said support area and said vertical shoulder providing a locating surface to receive an additional vertically positioned block thereon wherein the additional block is positioned rearwardly from the front surface of the receiving and supporting block whereby a wall of tiers of such blocks extend rearwardly and upwardly from a support surface.

2. The block structure as set forth in claim 1 and said side surfaces being inwardly and rearwardly directed with respect to said frontal surface whereby joined adjacent blocks will effect a generally curved surface to a formed retaining wall.

3. The block structure as set forth in claim 1 and said side surfaces being outwardly and rearwardly directed with respect to said frontal surface whereby joined adjacent blocks will effect a generally curved surface to a formed retaining wall.

4. The block structure as set forth in claim 1 and,

a. said top including a second vertically extending shoulder adjacent one of said side surfaces of said block and in general horizontal alignment with and normal to said vertically extending shoulder adjacent said frontal surface of said block and said second to p surface extending thereover; and,

b. one of said side surfaces defining a lower vertical portion normal to said bottom and an upper, rearwardly inclined portion extending from said vertical portion terminating at said second top surface whereby the block provides a corner structure with an upper block locating surface and a continuous sloped frontal surface configuration.

5. The block structure as set forth in claim 1 and at least one vertical aperture provided to extend from said first support area of said top surface to said bottom surface thereof for weight reduction of the block during construction and filling and block connection means following construction of a retaining wall, said vertical shoulder positioned with respect to said aperture whereby said additional block positioned against said vertical shoulder will cover the aperture in the block thereunder.

6. The block structure as set forth in claim 5 and channel means formed in said top support area of said block extending from said aperture through said back surface thereof for placement of earth connecting means therein whereby the constructed wall may be tied to the earth to be retained.

7. The block structure as set forth in claim 5 and a pair of vertical apertures being provided in side-by-side relation through said block.

8. The block structure as set forth in claim 7 and a channel means formed in said top support area of said block extending from each of said apertures through said back surface thereof for placement of earth connecting means therein whereby the constructed wall may be tied to the earth to be retained.

9. The block structure as set forth in claim 8 and:

a. said channel means communicating with said vertical apertures.

* * * * *

US005161918A

United States Patent [19]

Hodel

[11] Patent Number: 5,161,918

[45] Date of Patent: Nov. 10, 1992

[54] SET-BACK RETAINING WALL AND CONCRETE BLOCK AND OFFSET PIN THEREFOR

[75] Inventor: Gerald W. Hodel, Roanoke, Ill.

[73] Assignee: Wedgerock Corporation, Roanoke, Ill.

[21] Appl. No.: 648,011

[22] Filed: Jan. 30, 1991

[51] Int. Cl.[5] E02D 29/04

[52] U.S. Cl. 405/286; 52/585; 52/605; 52/606; 405/284

[58] Field of Search 405/284, 285, 286; 52/585, 609, 608, 606, 593; 411/447, 446, 913, 508, 509

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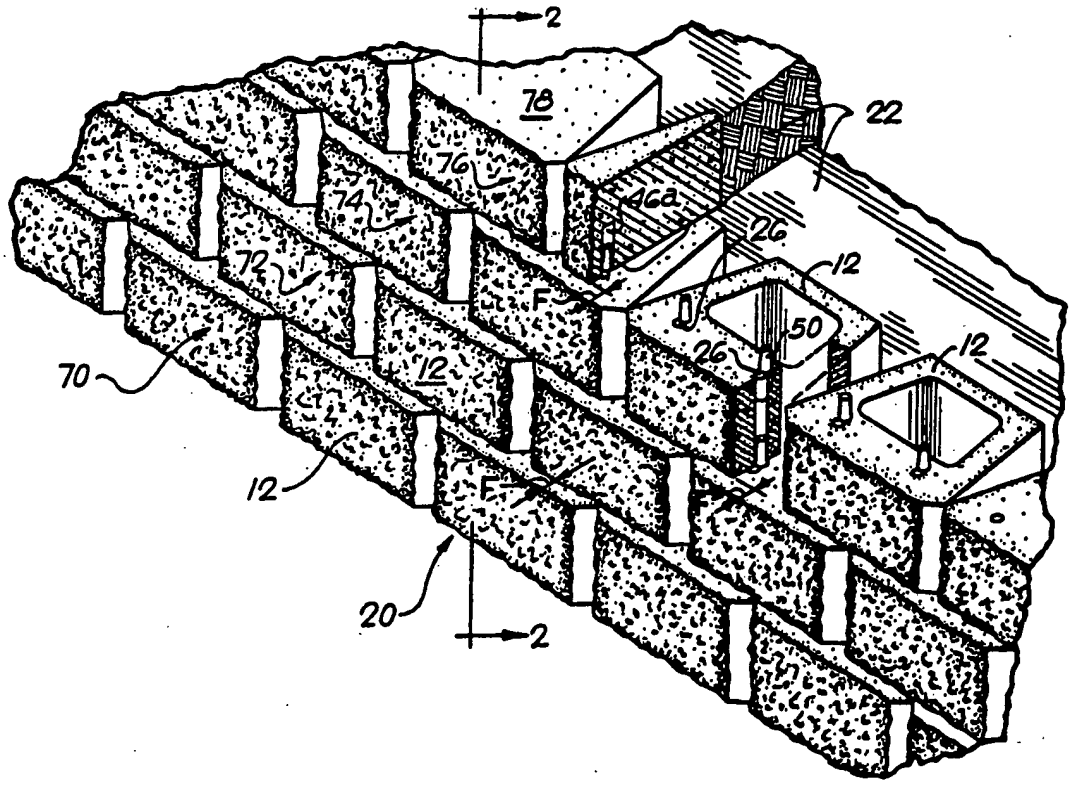
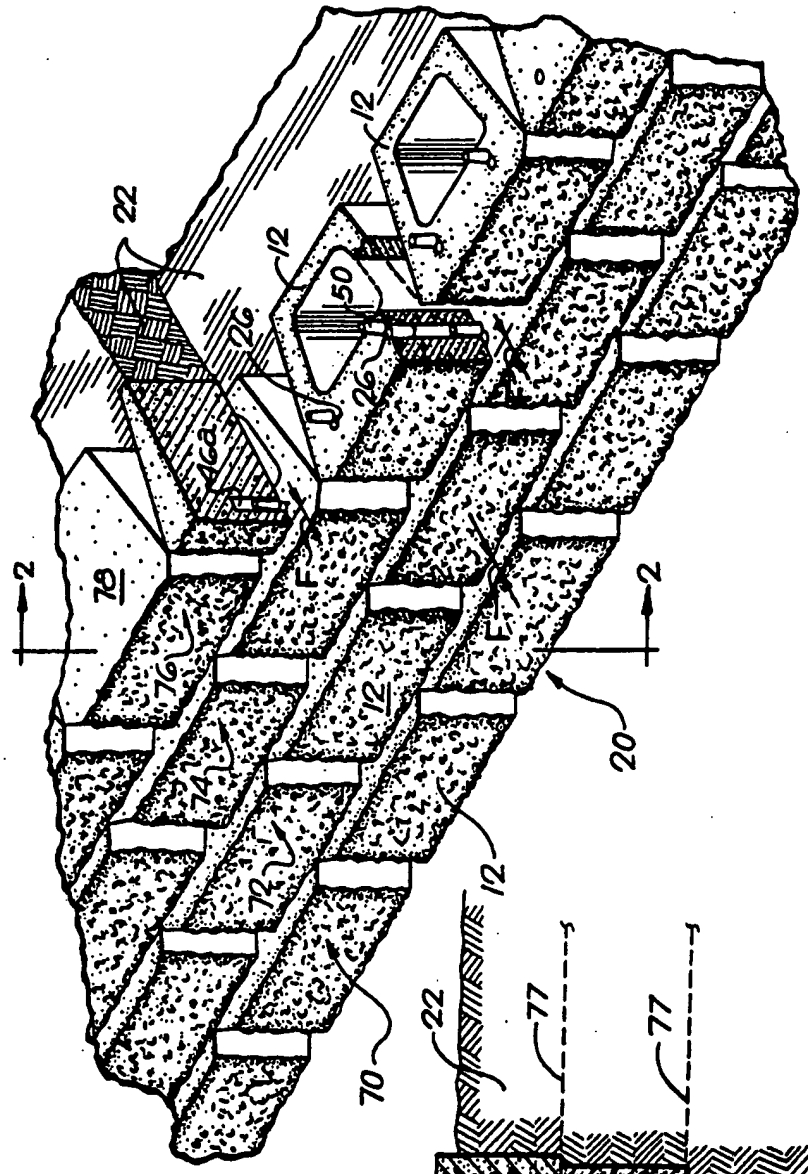
Primary Examiner—Dennis L. Taylor
Attorney, Agent, or Firm—McCaleb, Lucas & Brugman

[57] ABSTRACT

A mortarless concrete block retaining wall is formed from special blocks arranged in set-back tiers and interlocked by special offset pins. Each block is trapezoidal in plan view with a pair of vertical holes behind a relatively wide front face. The holes in adjacent tiers are laterally offset. The pins have opposite end sections which are laterally offset from one another and fit respectively in the offset holes to interlock adjacent tiers in set-back relation. The special pins are rotatably adjustable to interlock the tiers in a straight configuration or in varying degrees of convex and concave curved configurations.

12 Claims, 7 Drawing Sheets

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12
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FIG. 1

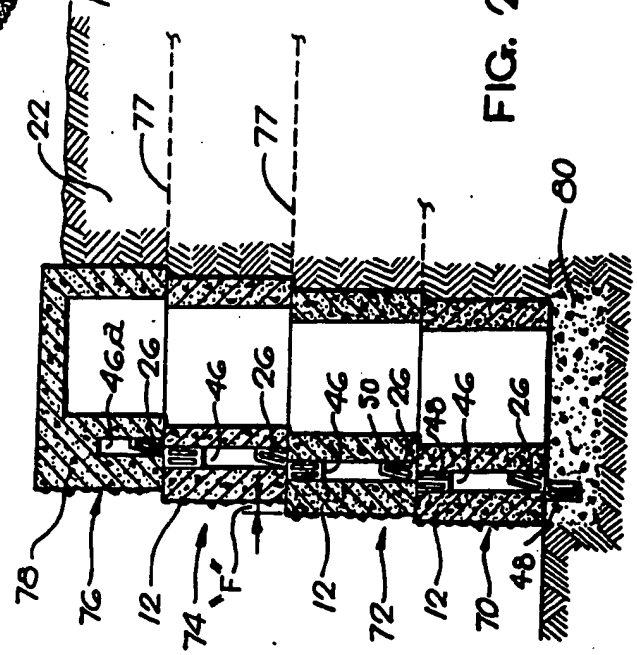
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FIG. 2

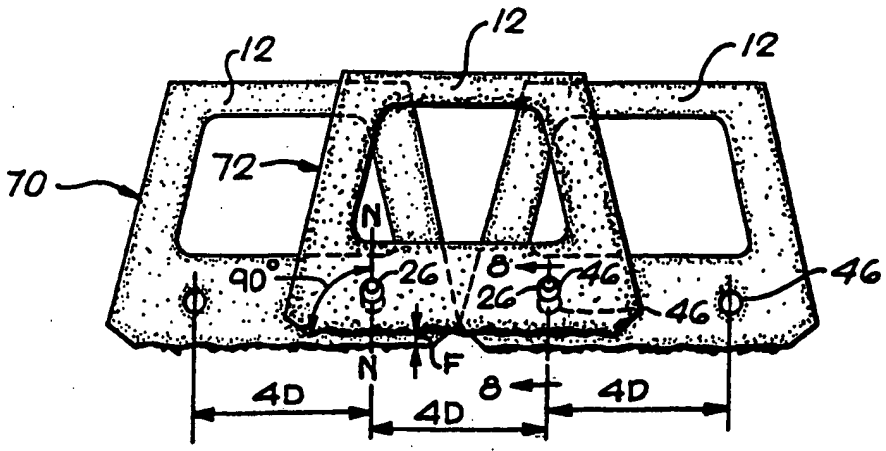

FIG. 3

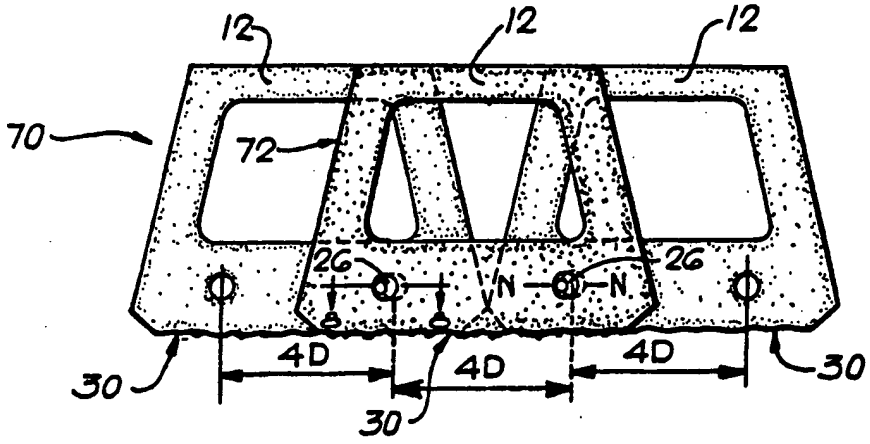

FIG. 4

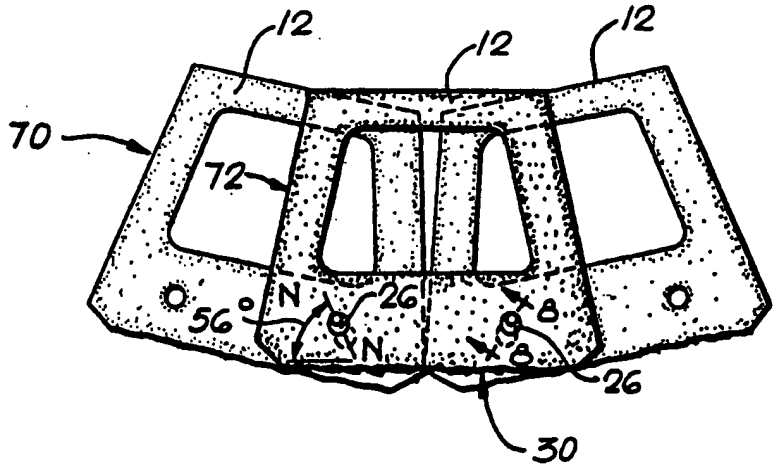

FIG. 5

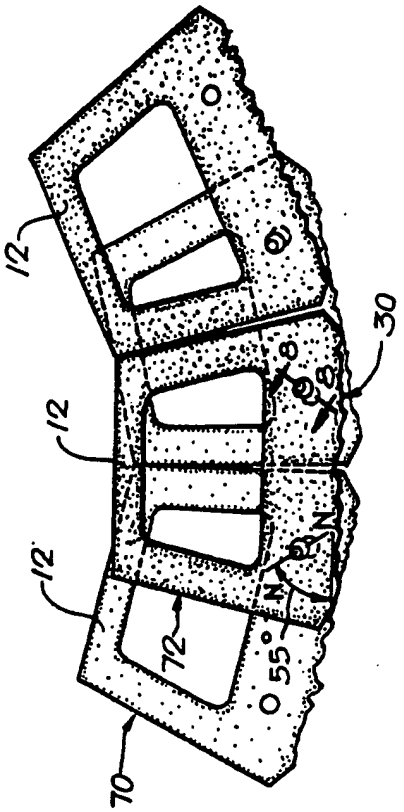

FIG. 6

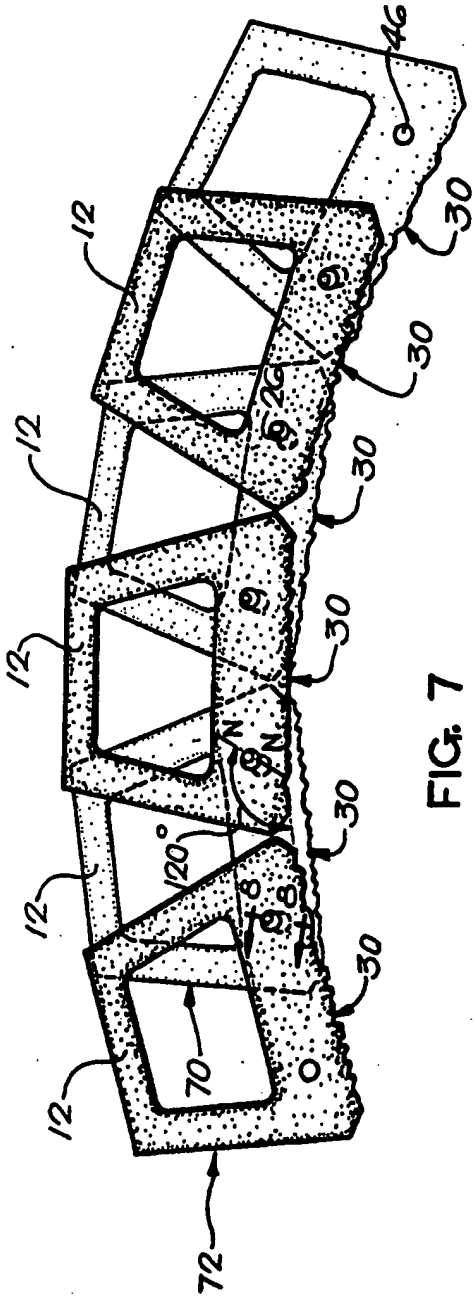

FIG. 7

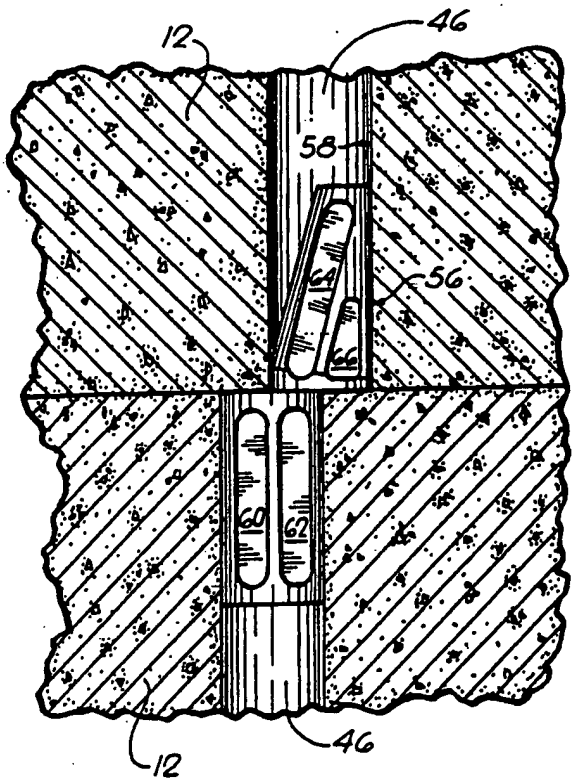

FIG. 8

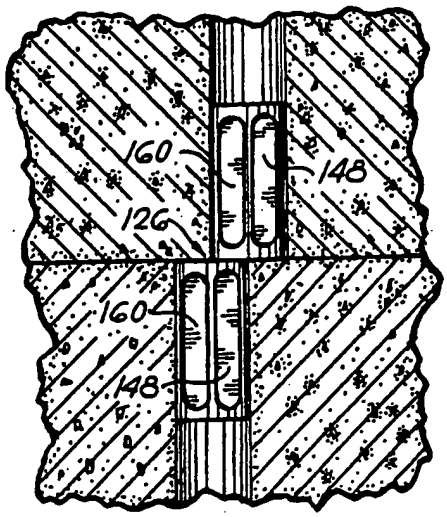

FIG. 9

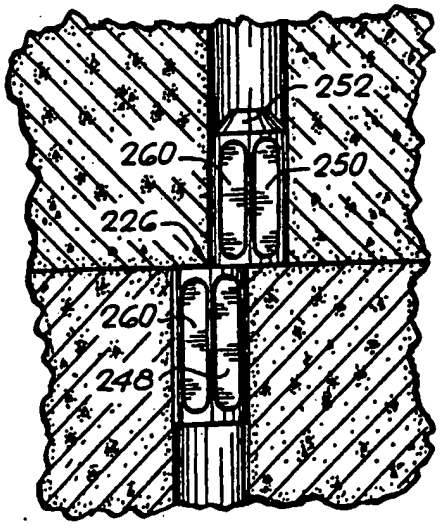

FIG. 10

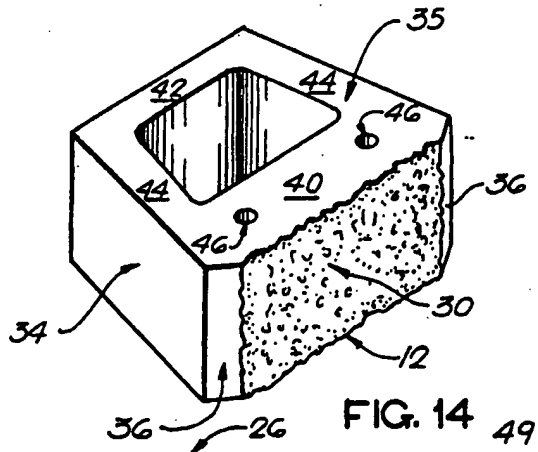

FIG. 14

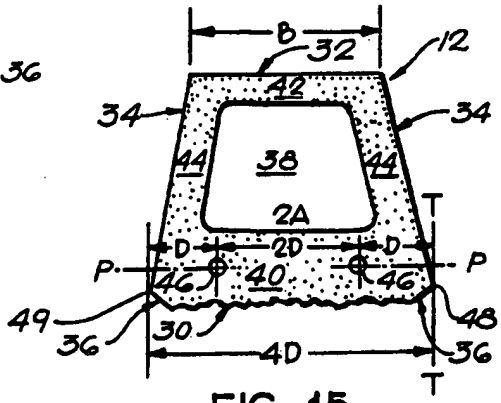

FIG. 15

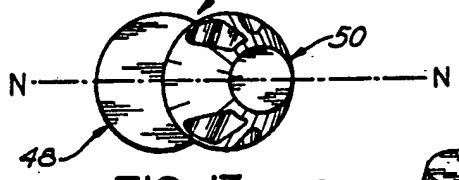

FIG. 13

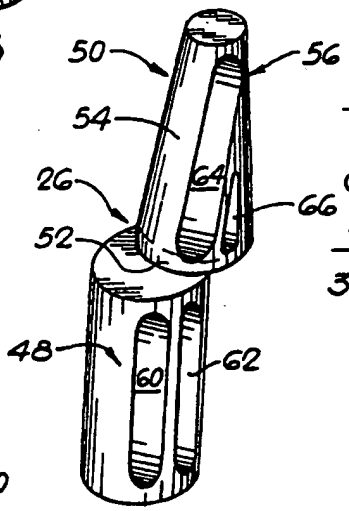

FIG. 11

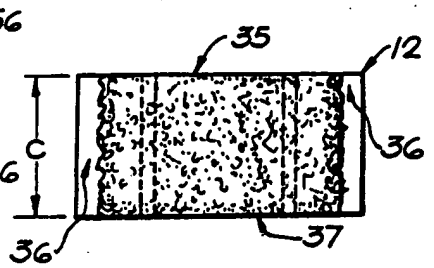

FIG. 16

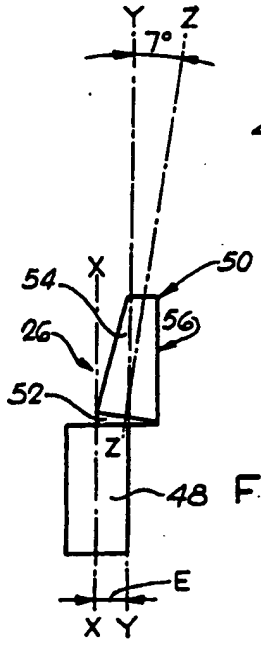

FIG. 12

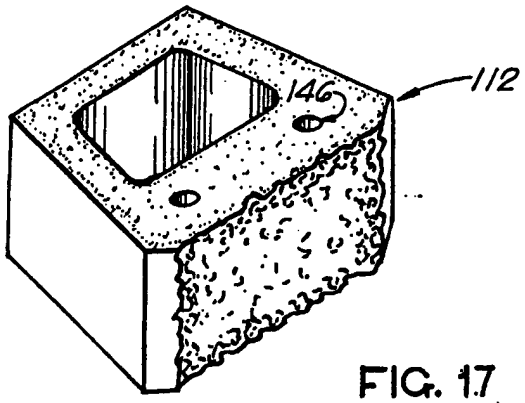

FIG. 17

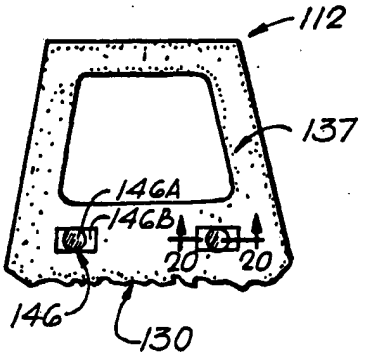

FIG. 19

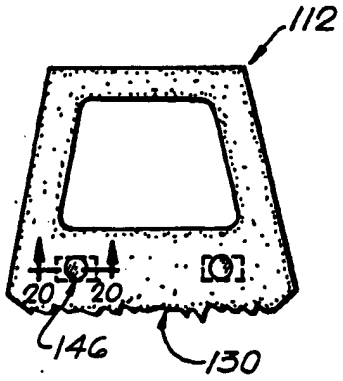

FIG. 18

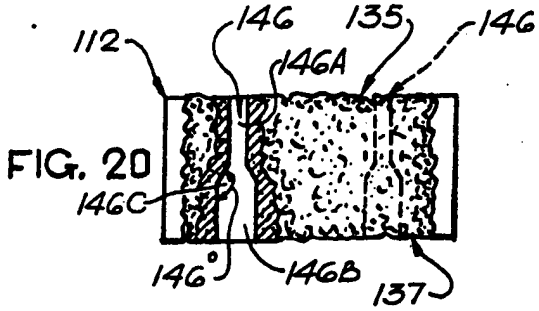

FIG. 20

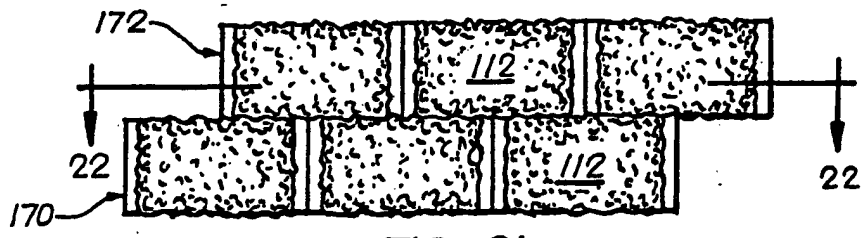

FIG. 21

FIG. 22

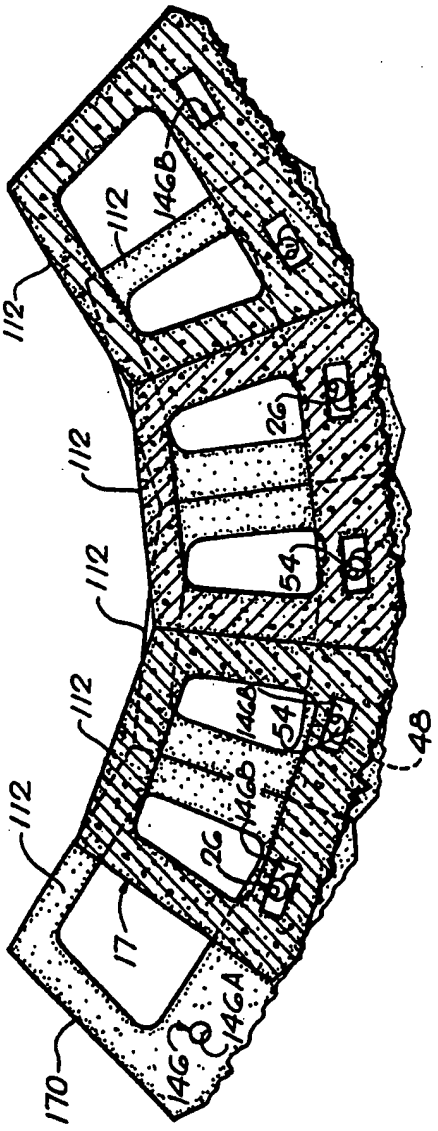
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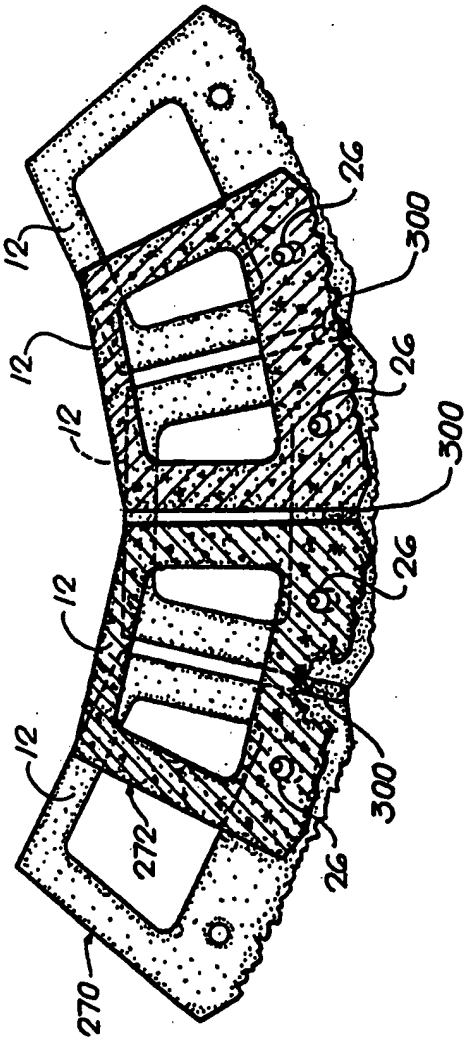
FIG. 23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SET-BACK RETAINING WALL AND CONCRETE BLOCK AND OFFSET PIN THEREFOR

CROSS REFERENCE TO RELATED APPLICATIONS

This application covers a concrete block retaining wall using set-back tiers of blocks interlocked by offset pins. A preferred form of block for this purpose is shown in applicant's U.S. design application, Ser. No. 07/636,999, filed Jan. 3, 1991, and a preferred form of offset pin is shown in applicant's design application, Ser. No. 07/637,004, filed Jan. 3, 1991.

BACKGROUND OF THE INVENTION

The field of this invention is mortarless retaining walls.

Mortarless concrete block retaining walls have the advantages that they are inexpensive, easy to construct with unskilled labor, have long life, and will adapt to ground subsidence which could crack a poured concrete or mortared wall.

Many mortarless retaining walls have been constructed, using a wide variety of materials. Conventional mortarless retaining walls used to hold earth embankments are typically made of poured concrete, blocks of stone and concrete, and railroad ties. To provide adequate strength and long life, a retaining wall preferably is tilted somewhat into the embankment. The tiers of concrete blocks are progressively set back from lower tiers. In Dean Jr., U.S. Pat. No. 4,920,712, tiers of concrete blocks are held in progressively set-back relation by a complex arrangement of metal clips which hook into apertures in the back walls of individual blocks. This is costly and making curved walls with these blocks and clips is difficult and requires considerable skill. For example, to make a wall with an outside curvature (that is, outwardly convex) certain ears that are required for a straight wall must be carefully and precisely knocked off.

In Forsberg, U.S. Pat. Nos. 4,825,619 and 4,914,876, tiers of concrete blocks are progressively set back by a complex arrangement of multiple through-holes, cavities, recesses and pockets in blocks which are interlocked by pins extending from holes in one tier of blocks into arcuate pockets in blocks of the next tier above or below. These arcuate pockets plus a special recess are in the top surface of each block but are not the bottom surface (and vice versa), so the top and bottom surfaces are different and not interchangeable. Care must be exercised to keep the proper side of the block up or down while assembling a wall. Further, there are severe limitations in the minimum wall curvatures possible with any one configuration of the arcuate pockets required in the individual blocks.

These and other disadvantages of conventional retaining walls are overcome by the special wall blocks and offset pins of the present invention which will now to be described.

SUMMARY OF THE INVENTION

A general object of this invention is to provide a mortarless retaining wall which is inexpensive, easy to construct with unskilled labor, having adjacent tiers permanently interlocked in a predetermined set-back relationship, in a straight configuration, or in a wide range of optional convex and concave curved configurations.

In particular, the object of this invention is to provide a special concrete block and a special offset pin for interlocking a plurality of such blocks when arranged side by side in successive set-back tiers to thereby provide an improved, mortarless retaining wall.

One form of the improved block consists of a body which has an identical trapezoidal configuration in top and bottom plan views and has a relatively longer front face than rear face with a pair of vertical holes at front corner portions.

Alternatively another form of the improved block, for sharply curved walls, is characterized by a pair of straight, vertical through-holes each having an enlarged end portion to enable the offset connection pins to be swung through a wider range than would be possible with through-holes having the same diameter from end to end. More particularly, it is an object of this invention to provide a pair of hole means each comprising opposite, axially aligned hole end portions, one of which is elongated, preferably rectangularly, in a direction parallel to the front face of the block.

The offset pin consists of a body which has opposite laterally offset sections respectively engageable with corresponding holes in blocks in successive tiers to positively interlock the tiers and set back the blocks a predetermined amount in each tier relative to the blocks in a lower tier.

Another object is to provide an inexpensive, mortarless wall readily assembleable from a single set of identical blocks and identical offset pins, to provide a wide choice of convex and concave curved configurations in addition to a straight configuration.

Other objects and advantages will be apparent from the following description taken in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a retaining block wall constructed according to the present invention, partially cut away to show detail;

FIG. 2 is a vertical cross sectional view of FIG. 1 taken generally along line 2—2;

FIG. 3 is a fragmentary top view of the wall shown in FIGS. 1 and 2;

FIG. 4 is an optional fragmentary wall arrangement similar to FIG. 3;

FIG. 5 is a view similar to FIG. 3 showing a fragmentary convex curved wall;

FIG. 6 is a view similar to FIG. 5 showing another fragmentary curved convex configuration;

FIG. 7 is a fragmentary top view of a wall with the blocks arranged in concave curved configuration;

FIG. 8 is an enlarged cross sectional view of FIGS. 3, 4, 5, 6 and 7 taken on lines 8—8;

FIGS. 9 and 10 are views similar to FIG. 8 showing alternative forms of offset pins;

FIG. 11 is a perspective enlarged view of a preferred form of offset pin;

FIG. 12 is a side view of FIG. 11 showing specific dimensions for one example of the pin;

FIG. 13 is a top plan view of FIG. 11;

FIG. 14 is a perspective view of a preferred embodiment of a concrete block forming part of the present invention;

FIG. 15 is a top plan view of FIG. 14 showing dimensions of a specific block which has been used in connection with the offset pin shown in FIGS. 11–13;

FIG. 16 is a front view of FIG. 15;

FIG. 17 is a perspective view of an alternate form of concrete block embodying the present invention;

FIG. 18 is a top plan view of FIG. 17;

FIG. 19 is a bottom plan view of FIG. 17;

FIG. 20 is a front view of FIG. 17 with the block partly sectioned along lines 20—20 in FIGS. 18 and 19;

FIG. 21 is a fragmentary front view of a wall constructed of the blocks shown in FIGS. 17–20;

FIG. 22 is a horizontal sectional view of FIG. 21 taken along line 22—22; and

FIG. 23 is a fragmentary top view similar to FIG. 6 of an alternate form of wall constructed with the concrete blocks shown in FIGS. 14–16.

DESCRIPTION OF PREFERRED EMBODIMENTS

FIGS. 1 and 2 show a retaining wall generally designated 20 holding an earth embankment 22 in place. Wall 20 comprises tiers of identical blocks 12 interlocked together by offset pins 26. The blocks 12 and pins 26 have special configurations according to the present invention. All the blocks 12 are identical as best shown in FIGS. 14–16. All the offset pins are identical as best shown in FIGS. 8 and 11–13.

Block 12 is a unitary member preferably of high density concrete. As best shown in FIGS. 14–16, actual dimensions of one representative block are given. It comprises a body, identically trapezoidal in top and bottom plan views, the width 40 of the front surface 30 being 16" and the width B of the rear surface 32 being 11". This trapezoidal shape readily enables the blocks to form a convex wall as illustrated in FIGS. 5 and 6. The height C of the block is 7⅝" and it has straight, diagonal side surfaces 34,34, and top and bottom horizontal surfaces 35 and 37 respectively. The front surface includes relatively smooth diagonal vertical corner surfaces 36,36 to provide an attractive ornamental effect in a wall face.

The block has a generally trapezoidal-shaped recess 38 extending completely through the block. It is defined by front and rear webs 40,42 and side webs 44,44. One inch diameter (or slightly larger for clearance) vertical through-holes 46 extend completely through the front corner portions of the block at equal distances from the side walls.

As shown in FIG. 15, the spacing 2D between the centers of the holes 46 is 8" and the spacing D between the holes and each corresponding side is 4". As a general relationship, for other sizes of blocks, the holes 46 are located in a vertical plane P—P parallel to the front face 30 in positions equally spaced a distance D from the transverse vertical plane T—T which intersects each maximum-width corner 48 of the block. The general relationship is:

D=the distance between the center of a hole 46 and the corresponding maximum width point of the block as above defined;

2D=the center-to-center distance between holes 46,46; and

4D=the maximum width of the block, between points 48,48 in the present example.

This special relationship enables the blocks to be assembled in a wall side by side and in abutting relation in successive tiers without excessive space or crowding between adjacent blocks through a wide range of convex, concave and straight configurations.

Referring to offset pin 26, best shown in FIGS. 8, 11, 12 and 13, this may be any suitable size. Actual dimensions of one representative size which has been used successfully with blocks dimensioned as shown in FIG. 15 and 16 are given in the description of FIG. 12.

The offset pin 26 may be made of any suitable material, preferably a one-piece injection-molded plastic material such as polyethylene or nylon. The pin 26 comprises a body with opposite offset end sections 48 and 50. Section 48 is cylindrical having a 1" diameter to fit in one of the plus-1" holes 46 in the block 12. Section 50 is generally conical with a short 1" diameter cylindrical base portion 52 and an upper, tilted conical portion 54. The base portion 52 has a 1" diameter to fit in a 1" diameter hole 46 in an upper tier to interlock adjacent tiers.

The cylindrical section 48 and cylindrical base portion 52 extend along spaced parallel axes X—X and Y—Y which in the present example are offset E=¼" to provide a set-back of ¼" in successive tiers. If a different setback is desired, the offset E built into the pins would be different; and the diameter of the pin sections, and holes in the block may be different. The conical portion 54 enables a block to be assembled onto a block in a lower tier without first precisely registering the holes 46 in the respective blocks. The conical shape guides the upper block precisely into the desired set-back position as it is lowered to engage the cylindrical base portion 52. The axis Z—Z of conical portion 54 is tilted (to the right in FIG. 12) at an angle sufficient to bring conical side surface 56 into engagement with an inside vertical surface portion 58 of hole 46 in an upper tier block 12 as best shown in FIGS. 8 and 12. As shown in FIG. 12 the angle of tilt of the cone portion axis Z—Z is about 7°. This substantial longitudinal engagement of the upper conical section with the corresponding block along vertical surfaces 56 and 58 effectively and precisely interlocks blocks in the successive tiers.

Grooves 60–66 (FIGS. 8 and 11) are provided in the pin sections to conserve material, lighten weight, facilitate injection-molding efficiency, and control shrinkage.

In the example shown in FIGS. 1 and 2, the retaining wall 20 has tiers 70,72 and 74 comprising blocks 12 positioned side-by-side in each tier; and a top tier 76 of cap pieces 78 which as illustrated are identical to the blocks 12 except they are solid on the top surface, and the holes 46a extend only part way up from the bottom surfaces.

The wall is constructed by laying the first tier 70 of blocks 12 on a suitable bed of compacted granular fill 80 (FIG. 2). Cylindrical pin sections 48 extend down into the fill to stabilize the wall. A second set of pins 26 will be inserted, cylindrical section 48 down, into the upper ends of holes 46 of the blocks in tier 70 with their central plane N—N (FIG. 13) at right angles to the front face in a straight wall. See FIG. 3. Blocks 12 comprising the second tier 72 will then be placed on tier 70 with the upper conical pin sections 50 received in the lower end portions of holes 46. Two of the blocks 12 in the first tier 70 and one of the blocks in the second tier 72, so connected by a pair of pins 26, are shown in FIG. 3. FIG. 8 shows a much enlarged cross-section of one of the pins in this position with the surrounding block portions. This arrangement will be duplicated through tiers 70 and 72 to interlock them in precise set-back

determined by the offset of the pins 26. In the present example, that set-back F is ¼". Similarly, tier 74 will be assembled and interlocked by pins 26 onto tier 72 in ¼" set-back relation, and the cap pieces 78 in tier 76 will be assembled and interlocked onto tier 74 in ¼" set-back relation. Conventional mesh sheets 77 (FIG. 2) may be used to tie the wall into the embankment.

An alternative form of straight wall is shown in FIG. 4 with no set-back. There, the pins 26 are oriented with their central planes N—N parallel to the front faces 30.

FIGS. 5 and 6 show portions of a convex curved wall constructed with the blocks 12 and offset pins 26. In FIG. 5, the angle of the pin central plane N—N relative to the front surface 30 is about 56° and the same angle in FIG. 6 is about 55°, compared with 90° in FIG. 3.

FIG. 7 shows a portion of a concave curved wall constructed with the blocks 12 and offset pins 26. In this particular configuration, by comparison with FIGS. 5 and 6, the angle of the pin central plane N—N relative to the front face 30 is about 120°.

Alternative forms of offset pins 126 and 226 are shown in FIGS. 9 and 10 respectively. Pin 126 comprises two cylindrical sections 148,148 which are the same and may be identical to cylindrical section 48. Pin 226 comprises a lower cylindrical section 248 which may be identical to cylindrical section 48 and an upper cylindrical section 250 having an upper, chamfered end 252. Grooves 160 and 260, similar to grooves 60–66 may be provided in pins 126 and 226.

Referring now to the alternate form of concrete block shown in FIGS. 17–21, this is shown as identical to block 12 described above, except for the vertical hole means which are specially contoured to facilitate constructing walls with relatively small radius curves. This alternate block is generally designated 112 and each of the vertical hole means is designated 146. Each hole means comprises an upper end portion 146A and a lower end portion 146B joined by an intermediate section 146C defined by a wall inclined at 146° as shown in FIG. 20.

It will be appreciated that the dimensions given for the blocks, hole means, and pins in this description are merely for purposes of illustration and are not limiting in any way. The specific dimensions given may be varied widely in practicing this invention. For example, while the hole means 46 is illustrated in FIG. 15 as slightly more than 1" diameter to accommodate 1" diameter offset pins 26, 126 and 226, these hole means may start out with 1¼" diameter to allow for mold abrasion by the sand and concrete raw materials. This abrasion wears away the mold rods which define the holes in the concrete, making the resultant holes in the concrete blocks smaller and smaller throughout a production run.

Referring now to the bottom view of block 112 in FIG. 19, the lower hole portion 146B is elongated in the lower surface 137. Further, end portion 146B is elongated in a direction parallel to the front face 130. More specifically, in FIG. 19, each hole end portion 146B is rectangular with a long dimension of 2¼" and a short dimension of 1¼", the latter matching the diameter of the round cross section in opposite hole end portion 146A.

FIGS. 21 and 22 show a portion of a convex, curved wall constructed of the alternate blocks 112 interconnected by pins 26. In this case, the cylindrical pin sections 48 will be fitted in the round cross section upper hole end section 146A in lower tier 170, and the conical section 54 will be fitted in the lower, rectangular shaped hole end section 146B in upper tier 172. As shown in FIG. 22, the upper conical pin sections 54 will be oriented at appropriate, different angles to accommodate the small radius wall shown. While two tiers 170 and 172 are shown in FIGS. 21 and 22, in an actual wall, additional tiers will be constructed as determined by the height requirement for the job.

Referring to FIG. 23, an alternative wall construction is illustrated using blocks 12 interconnected by pins 26. There is a first, lower tier section 270 with three blocks 12 and a second, upper tier 272 illustrated with two blocks 12. In very tight, small-radius curved walls, where the upper tiers are progressively set back from the lower tiers, the adjacent blocks may be spaced apart in decreasing amounts in successively upper tiers. For example as shown in FIG. 23 the blocks in the lowest tier 270 are spaced apart ¼". In the next tier 272 they are spaced ⅛" apart. In the third and fourth tiers (not shown) the blocks would be spaced apart ⅛" and 0" respectively. This would be a four-tier wall with the top tier being cap blocks such as those designated 78 in FIGS. 1 and 2. If desired, filler material 300 may be placed in the spaces between the blocks. This may be of any suitable material such as plastic, wood, styrofoam, or mortar. Alternatively, this filler material may be selectively omitted or purposely made with some porosity to allow for drainage while still retaining the earth fill behind the wall.

While particular examples of the invention have been shown and described, changes and modifications may be made therein without departing from the invention in its broadest aspect. The aim of the appended claims, therefore, is to cover all such changes and modifications included within the spirit and scope of the invention.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A retaining wall comprising:
a lower tier of blocks arranged side by side, each block in the lower tier having a body with hole means at least in a top surface;
an upper tier of blocks arranged side by side, each block in the upper tier having a body with hole means at least in a bottom surface;
said upper tier being positioned on top of the lower tier with the hole means in the upper tier being laterally offset from corresponding hole means in the lower tier;
offset pin means fitted in the respective hole means to interlock the blocks in the upper and lower tiers, each of said pin means comprising opposite end sections which are laterally offset from one another to fit within respective offset hole means in the blocks in the upper and lower tiers to thereby interlock them in laterally offset relation, and
each of said pin means being rotatably adjustable in the respective hole means to interlock the tiers in a straight configuration or in varying degree of convex and concave curved configurations.

2. A retaining wall comprising:
a lower tier of blocks arranged side by side;
an upper tier of blocks arranged side by side and located on top of the first tier of blocks;
each of said blocks having a body with front, back, top, bottom and side surfaces;
each of the block bodies in the lower tier having vertical hole means at least in the top surface of the

body, and each of the block bodies in the upper tier having vertical hole means at least in the bottom surface thereof, the hole means in the upper tier being laterally offset from corresponding hole means in the lower tier; and

offset pin means interlocking the block bodies in the upper tier with the block bodies in the lower tier in laterally offset relation, each of said pin means comprising a pin body with opposite end sections which are laterally offset from one another and which are engaged respectively in corresponding laterally offset hole means in block bodies in the upper and lower tiers.

3. A retaining wall according to claim 2 in which the hole means in the block bodies in the upper and lower tiers are in the same positions relative to the front, rear and side surfaces of the bodies.

4. A retaining wall according to claim 2 in which the top and bottom surfaces of the block bodies are substantially identical enabling said top and bottom surfaces to be interchangeable in use.

5. A retaining wall according to claim 2 in which the hole means in the top and bottom surfaces of each block body are axially aligned.

6. A retaining wall according to claim 2 in which the hole means in each block body comprises a pair of laterally spaced vertical holes in at least one of the top and bottom surfaces of each body set back an equal distance from the front surface, and set inwardly equal distances from the side surfaces.

7. A retaining wall according to claim 2 in which said vertical hole means is provided in both the top and bottom surfaces of the block body, and the hole means in both said surfaces are axially aligned in identical positions.

8. A retaining wall according to claim 2 in which each block body comprises:

top and bottom horizontal surfaces;

front and back generally parallel surfaces, the front surface being substantially roughened relative to the other surfaces and being substantially wider than the back surface;

straight side surfaces extending diagonally between said front and back surfaces;

said block body having spaced parallel front and back web portions extending along the front and back surfaces, and diagonal web portions extending along the diagonal side surfaces, said web portions defining a recess which is trapezoidal in plan view and extends between the top and bottom surfaces;

said hole means comprising a pair of vertical holes extending through the front web portion and located in a vertical plane parallel to the front face in positions equally spaced from the side surfaces; and

a relatively smooth diagonal vertical corner surface connecting each end of the roughened front surface with a corresponding one of the diagonal side surfaces.

9. A retaining wall according to claim 2 in which each block body comprises a generally trapezoidal shape in plan view, with the front surface wider than the back surface, and the two side surfaces extending diagonally therebetween.

10. A retaining wall according to claim 9 comprising a central roughened face portion flanked by relatively smooth beveled, vertical corner surfaces connecting each end of the front surface to a corresponding one of the side surfaces.

11. A retaining wall according to claim 2 in which the body has a generally trapezoidal shape in plan view with the front surface wider than the rear surface and the side surfaces diagonally disposed enabling the tiers to be curved, said hole means comprising a pair of vertical holes located in the front part of the body along a line behind and parallel to the front surface, said holes being spaced equal predetermined distances from the widest parts of the corresponding side surfaces, and spaced apart a distance twice each of said predetermined distances.

12. A retaining wall according to claim 11 in which said body has a vertical diagonal corner wall at the intersection of the front surface and each side surface, and said widest parts of the corresponding side surfaces are at the rear edges of the diagonal corner walls.

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Sievert

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[54] COMPOSITE MASONRY BLOCK

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Related U.S. Application Data

[60] Division of Ser. No. 534,831, Jun. 7, 1990, Pat. No. 5,062,610, which is a continuation-in-part of Ser. No. 413,400, Sep. 28, 1989, abandoned, and a continuation-in-part of Ser. No. 413,050, Sep. 28, 1989, abandoned.

[51] Int. Cl.[5] E02D 29/02

[52] U.S. Cl. 405/286; 52/604; 405/262

[58] Field of Search 405/258, 273, 284, 285, 405/286; 52/561, 596, 604, 608, 609, 610

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[57] ABSTRACT

The present invention includes landscaping structures such as a retaining wall comprising a plurality of composite masonry blocks, the composite masonry block comprising a block body having an irregular trapezoidal shape and comprising a front surface and a back surface, an upper surface and a lower surface, and first and second sidewalls. Both the first and second sidewalls have a first and second part, the sidewall first part extends from the block front surface towards the block back surface at an angle of no greater than ninety degrees in relationship to the block front surface, the sidewall second part surfaces adjoins and lies between the sidewall first parts and the block back surface. The block also has a flange extending from the block back surface past the height of the block.

20 Claims, 5 Drawing Sheets

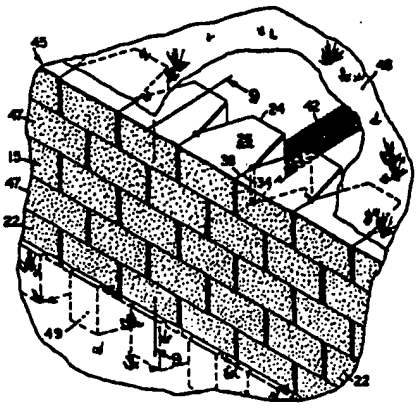

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FIG. 1

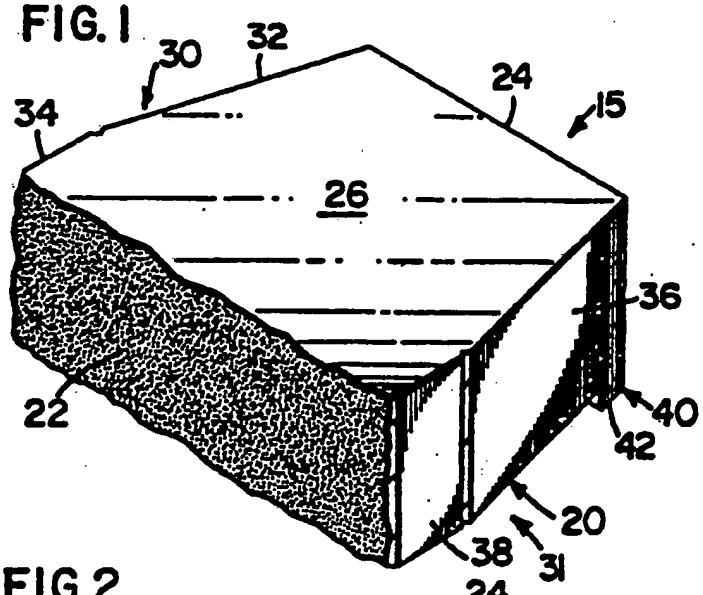


FIG. 2

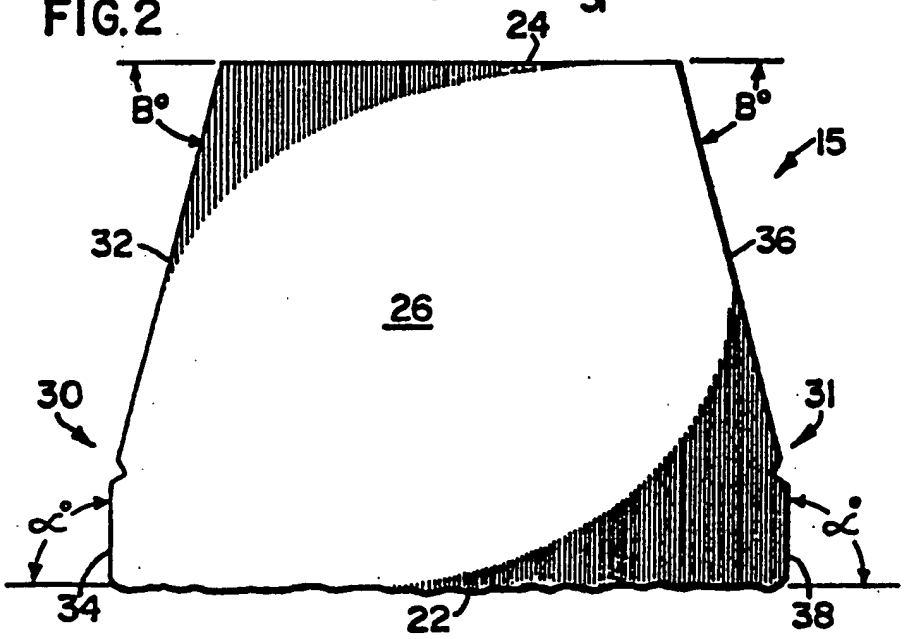


FIG. 3

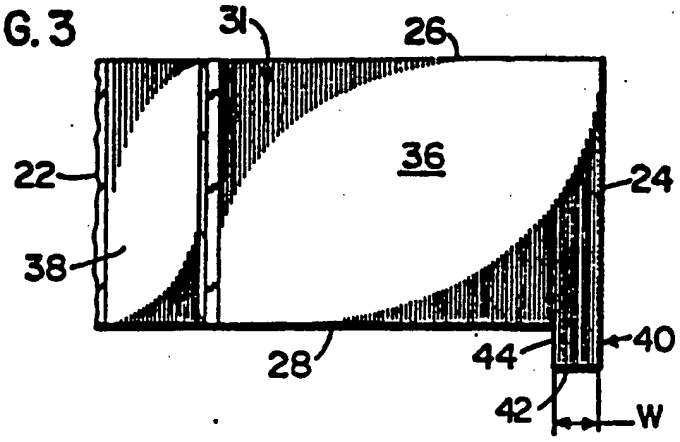


FIG.4

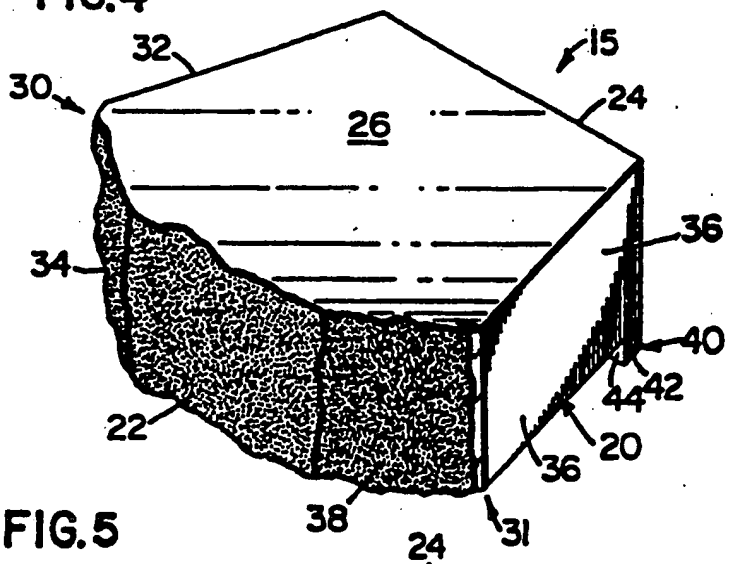


FIG.5

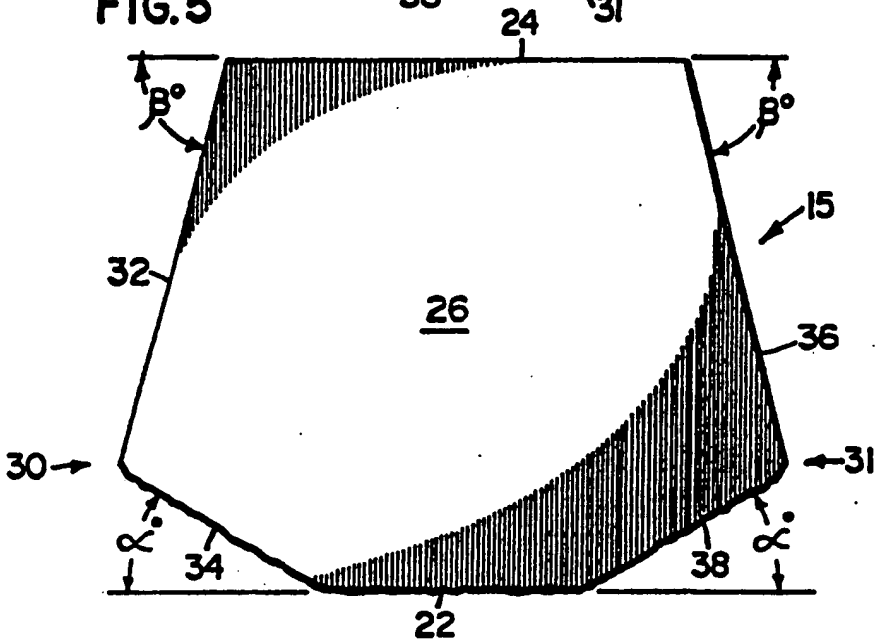


FIG.6

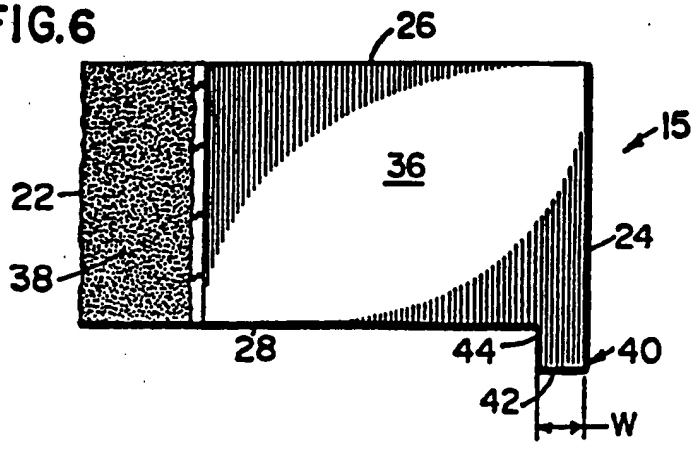


FIG. 7

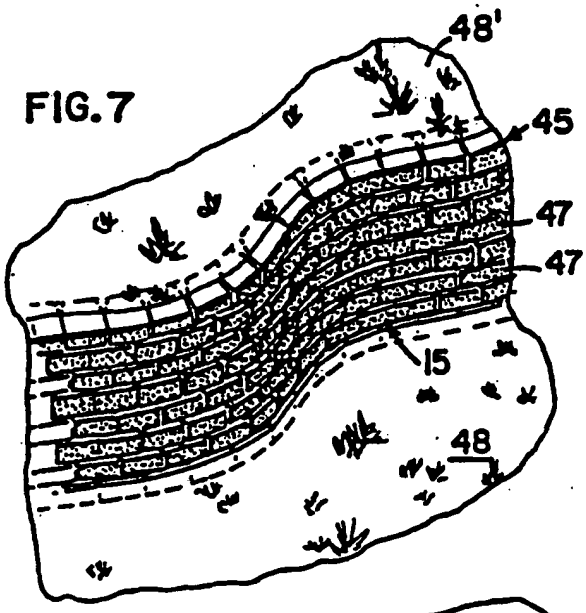


FIG. 8

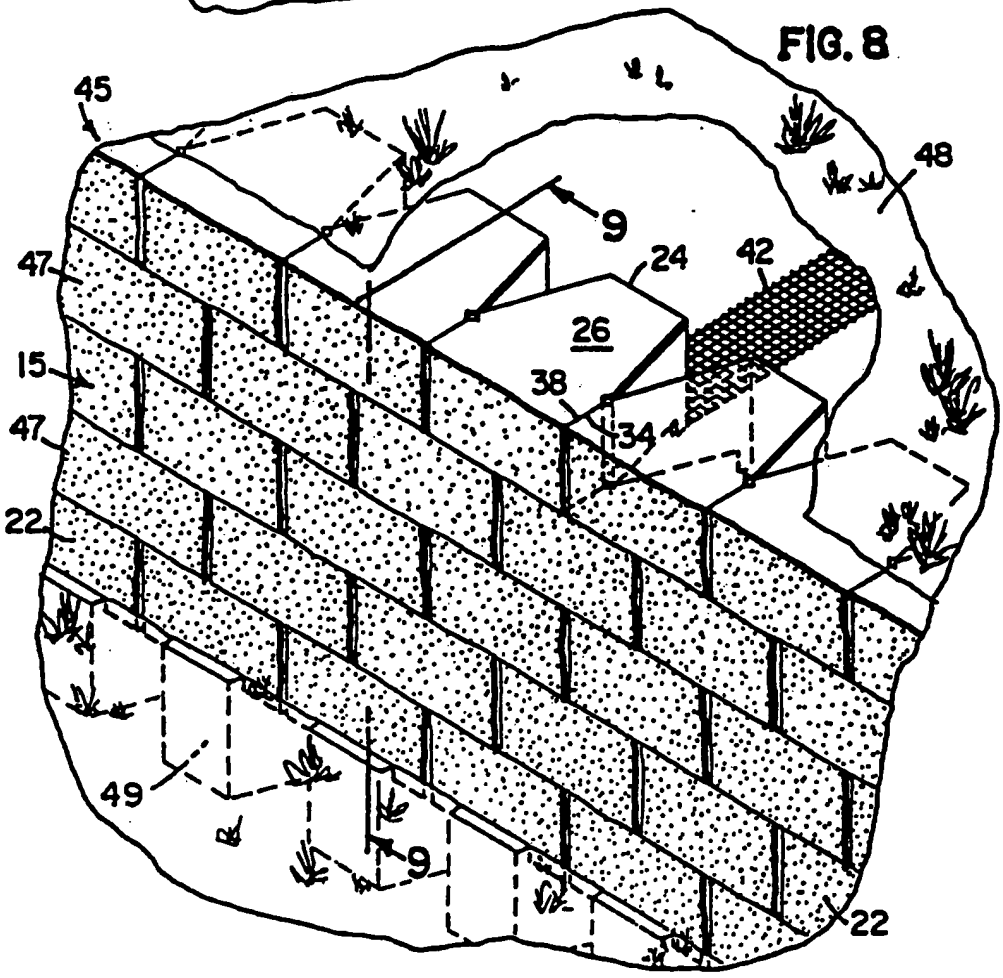


FIG. 9

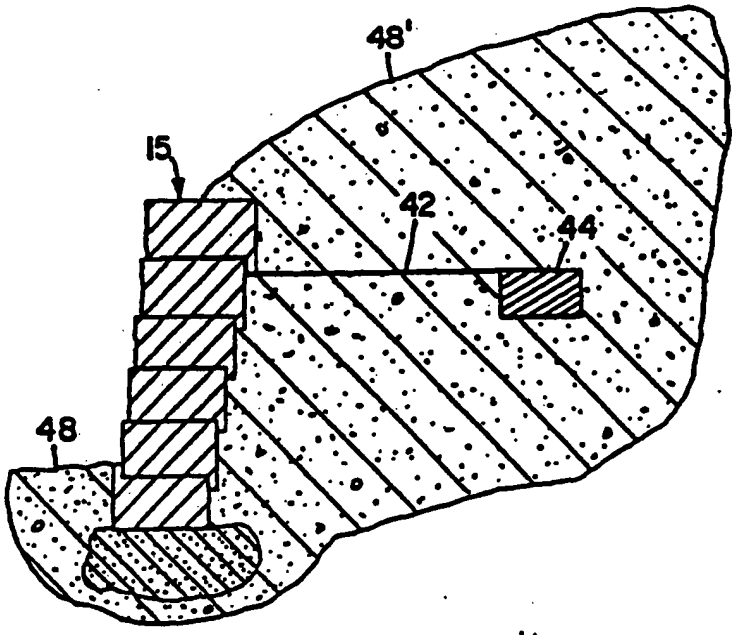


FIG. 10

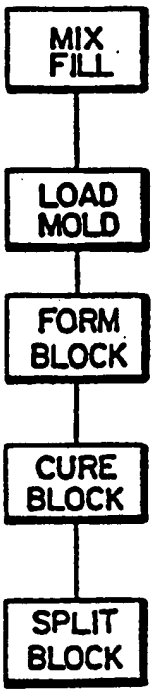


FIG. 11

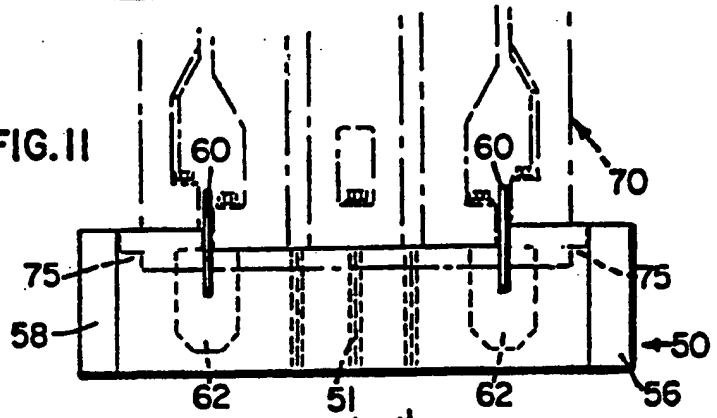
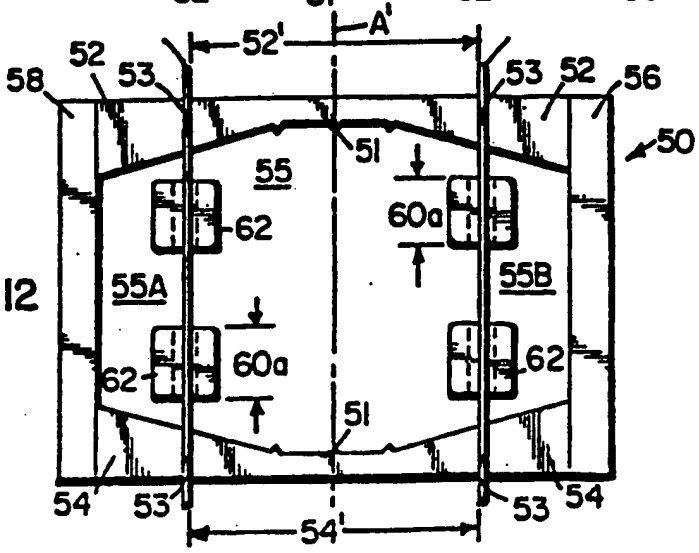


FIG. 12



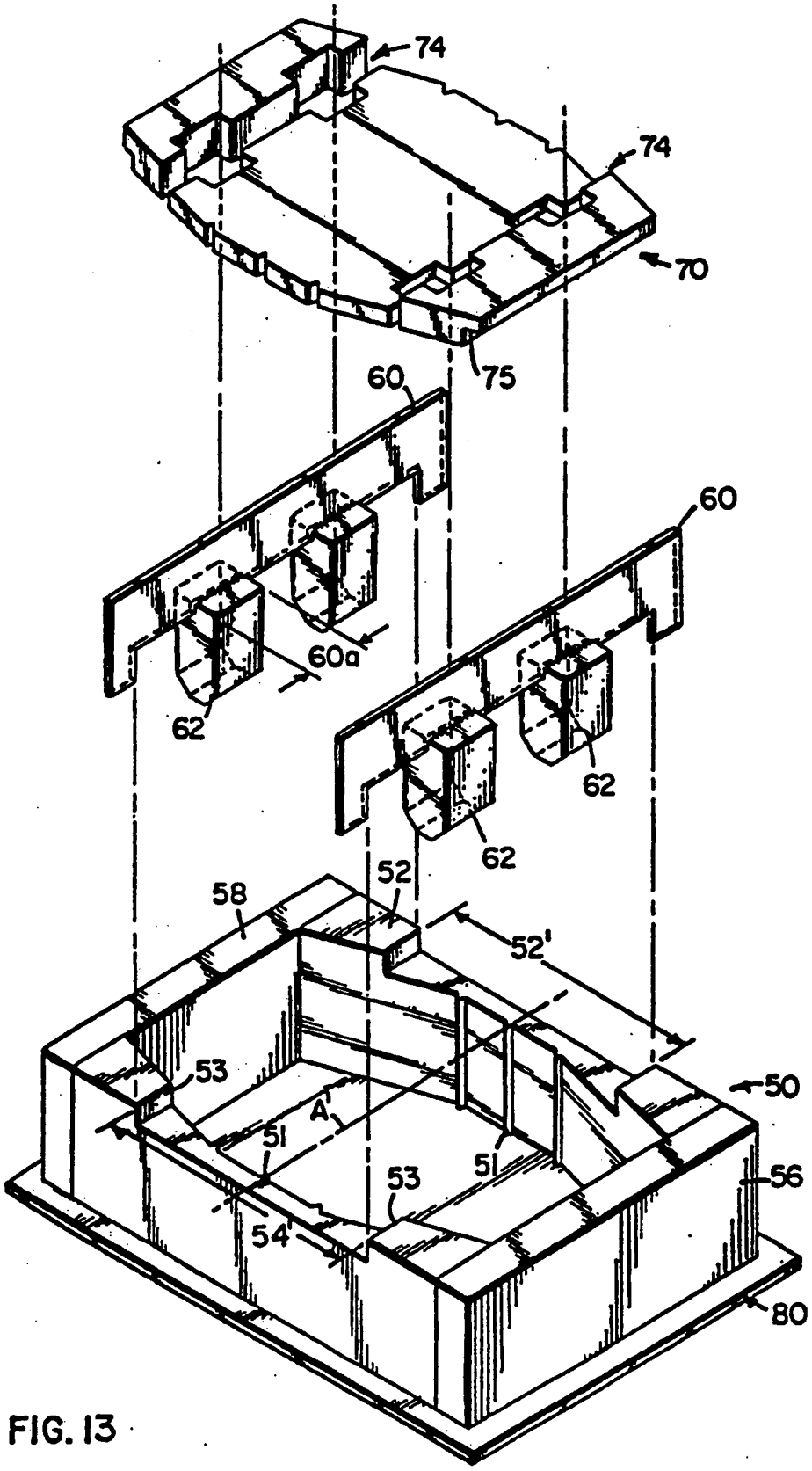


FIG. 13

COMPOSITE MASONRY BLOCK

This is a divisional of application Ser. No. 07/534,831, filed Jun. 7, 1990, now U.S. Pat. No. 5,062,610, which is a continuation-in-part of U.S. patent application Ser. Nos. 07/413,400 and 07/413,050 both filed Sep. 28, 1989 and now abandoned.

FIELD OF THE INVENTION

This invention relates generally to masonry blocks which may be used in the construction of landscaping elements. More specifically, the present invention relates to masonry block manufacturing processes and the resulting high strength masonry blocks which may be used to construct structures such as retaining walls of variable patterns.

BACKGROUND OF THE INVENTION

Soil retention, protection of natural and artificial structures, and increased land use are only a few reasons which motivate the use of landscape structures. For example, soil is often preserved on a hillside by maintaining the foliage across that plane. Root systems from trees, shrubs, grass, and other naturally occurring plant life work to hold the soil in place against the forces of wind and water. However, when reliance on natural mechanisms is not possible or practical man often resorts to the use of artificial mechanisms such as retaining walls.

In constructing retaining walls many different materials may be used depending upon the given application. If a retaining wall is intended to be used to support the construction of an interstate roadway, steel or a concrete and steel retaining wall may be appropriate. However, if the retaining wall is intended to landscape and conserve soil around a residential or commercial structure a material may be used which compliments the architectural style of the structure such as wood timbers or concrete block.

Of all these materials, concrete block has received wide and popular acceptance for use in the construction of retaining walls and the like. Blocks used for these purposes include those disclosed by Risi et al, U.S. Pat. Nos. 4,490,075 and Des. 280,024 and Forsberg, U.S. Pat. Nos. 4,802,320 and Des. 296,007 among others. Blocks have also been patterned and weighted so that they may be used to construct a wall which will stabilize the landscape by the shear weight of the blocks. These systems are often designed to "setback" at an angle to counter the pressure of the soil behind the wall. Setback is generally considered the distance which one course of a wall extends beyond the front of the next highest course of the same wall. Given blocks of the same proportion, setback may also be regarded as the distance which the back surface of a higher course of blocks extends backwards in relation to the back surface of the lower wall courses. In vertical structures such as retaining walls, stability is dependent upon the setback between courses and the weight of the blocks.

For example, Schmitt, U.S. Pat. No. 2,313,363 discloses a retaining wall block having a tongue or lip which secures the block in place and provides a certain amount of setback from one course to the next. The thickness of the Schmitt tongue or lip at the plane of the lower surface of the block determines the setback of the blocks. However, smaller blocks have to be made with smaller tongues or flanges in order to avoid compromising the structural integrity of the wall with excessive setback. Manufacturing smaller blocks having smaller tongues using conventional techniques results in a block tongue or lip having inadequate structural integrity. Concurrently, reducing the size of the tongue or flange with prior processes may weaken and compromise this element of the block, the course, or even the entire wall.

Previously, block molds were used which required that the block elements such as a flange be formed from block mix or fill which was forced through the cavity of the mold into certain patterned voids within the press stamp or mold. The patterned voids ultimately become the external features of the block body. These processes relied on the even flow of a highly viscous and abrasive fill throughout the mold, while also not allowing for under-filling of the mold, air pockets in the fill or the mold, or any other inaccuracies which often occur in block processing.

The result was often that a block was produced having a well compressed, strong block body having weak exterior features. Any features formed on the block were substantially weaker due to the lack of uniform pressure applied to all elements of the block during formation. In turn, weaker exterior features on the outside of the block such as an interlocking flange could compromise the entire utility of the block if they crumble or otherwise deteriorate due to improper formation.

The current design of pinless, mortarless masonry blocks generally also fails to resolve other problems such as the ability to construct walls which follow the natural contour of the landscape in a radial or serpentine pattern. Previous blocks also have failed to provide a system allowing the use of anchoring mechanisms which may be affixed to the blocks without complex pinning or strapping fixtures. Besides being complex, these pin systems often rely on only one strand or section of a support tether which, if broken, may completely compromise the structural integrity of the wall. Reliance on such complex fixtures often discourages the use of retaining wall systems by the every day homeowner. Commercial landscapers generally avoid complex retaining wall systems as the time and expense involved in constructing these systems is not supportable given the price at which landscaping services are sold.

As can be seen the present state of the art of forming masonry blocks as well as the design and use of these blocks to build structure has definite shortcomings.

SUMMARY OF THE INVENTION

In accordance with the present invention there is provided a composite masonry block comprising a block body having a front surface and a substantially parallel back surface, an upper surface and a lower surface, and first and second sidewall surfaces each comprising a first and second part. The sidewall first part extends from the block front surface towards the block back surface at an angle of no greater than ninety degrees in relationship to the block front surface. The sidewall second part adjoins and lies between the sidewall first part and the block back surface. The block of the present invention also comprises a flange extending from the block back surface past the height of the block.

In accordance with a further aspect of the present invention there are provided landscaping structures such as retaining walls comprising a plurality of courses, each of the courses comprising a plurality of the composite masonry blocks of the present invention.

In accordance with an additional aspect of the present invention there is provided a masonry block mold, the mold comprising two opposing sides and a front and back wall. The opposing sides adjoin each other through mutual connection with the mold front and back walls. The mold has a central cavity bordered by the mold opposing sides and the mold front and back wall. The mold opposing sides comprise stepped means for holding additional block mix in the mold cavity adjacent the front and back walls.

In accordance with another aspect of the present invention there is provided a method of using the composite masonry block mold of the present invention comprising filling the mold, subjecting the fill to pressure, and ejecting the formed masonry blocks from the mold.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a preferred embodiment of the mortarless retaining wall block in accordance with the present invention.

FIG. 2 is a top plan view of the mortarless retaining wall block shown in FIG. 1.

FIG. 3 is a side elevational view of a mortarless retaining wall block shown in FIG. 1.

FIG. 4 is a perspective view of an alternative embodiment of the mortarless retaining wall block in accordance with the present invention.

FIG. 5 is a top plan view of the mortarless retaining wall block depicted in FIG. 4.

FIG. 6 is a side elevational view of the mortarless retaining wall block depicted in FIGS. 4 and 5.

FIG. 7 is a partially cut away perspective view of a retaining wall having a serpentine pattern constructed with one embodiment of the composite masonry block of the present invention.

FIG. 8 is a partially cut away perspective view of a retaining wall constructed with one embodiment of the composite masonry block of the present invention showing use of the block with anchoring matrices laid into the ground.

FIG. 9 is a cut away view of the wall shown in FIG. 8 taken along lines 9—9.

FIG. 10 is a schematic depiction of one embodiment of the method of the present invention.

FIG. 11 is a side elevational view of one embodiment of the masonry block mold in accordance with the present invention.

FIG. 12 is a top plan view of the masonry block mold shown in FIG. 11 in accordance with the present invention.

FIG. 13 is an exploded perspective view of one embodiment of the masonry block mold of the present invention showing application of the supporting bars, core forms, and stamp plate.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Accordingly, the present invention provides a composite masonry block, structures resulting from this block, a masonry block mold for use in manufacturing the block of the present invention, and a method of using this mold. The present invention provides a mortarless interlocking masonry block having a high structural integrity which may be used to construct any number of structures having a variety of patterns. Moreover, the block of the present invention is made through a process and mold which facilitates and enhances the formation of a high strength block with an interlocking element which also has a high structural integrity and allows the fabrication of various landscaping structures of high strength.

COMPOSITE MASONRY BLOCK

Referring to the drawings wherein like numerals represent like parts throughout several views, a composite masonry block 15 is generally shown in FIGS. 1-3 and 4-6. The first aspect of the present invention is a composite masonry block having an irregular trapezoidal shaped block body 20.

The block body generally comprises a front surface 22 and a back surface 24 which are substantially parallel to each other. The front 22 and back 24 surfaces are separated by a distance comprising the depth of the block. The block also has an upper surface 26 and a lower surface 28 separated by a distance comprising the height of the block 15. The lower surface 28 generally has a smaller area proportion than the upper surface 26, FIG. 3.

The block also has a first 30 and second 31 sidewall separated by a distance comprising the width of the block, FIGS. 2 and 5. The sidewalls adjoin the block upper and lower surfaces. Both sidewalls comprise a first and second part. The sidewall first part extend from the block front surface towards the back surface at an angle of no greater than ninety degrees in relationship to the block front surface. The sidewall second part adjoins and lies between the first part and the block back surface.

The block also has a flange 40 spanning the width of the block back surface 24 and extending from the block back surface 24 past the height of the block, FIGS. 3 and 6. Generally, the flange comprises a setback surface 42 and a locking surface 44. The setback surface 42 extends from the lower edge of the flange 40 in a plane parallel to the block upper 26 and lower 28 surfaces towards the block front surface 22 to adjoin the flange locking surface 44. The locking surface extends from the plane of the block lower surface 28 and adjoins the setback surface 42.

The first element of the composite masonry block of the present invention is the body of the block 20, FIGS. 1-3. The block body 20 provides weight and physical structure to the system in which the block is used. Landscaping elements such as retaining walls often must be constructed of units which not only provide a structural impediment to resist the natural flow of soil, but must also provide the shear weight to withstand these forces. Moreover, the body of the block functions to provide the supporting surfaces which may be used to seat an aesthetically pleasing pattern such as that found on the front surface 22 of the block, FIG. 1. Finally the body of the block of the present invention provides a substrate for holding elements which help form an interlocking matrix with other blocks when used in a structure such as a wall. In particular, the block carries a flange 40 which assists in the interlocking function of the block.

Generally, the block may take any number of shapes in accordance with the present invention. Distinctive of the present invention is the ability to use the block seen in FIGS. 1-3 and 4-6 to construct either straight or serpentine walls. Accordingly, the block of the present invention preferably has an irregular trapezoidal shape having a parallel front 22 and back surfaces 24, FIG. 2. The necessarily irregular nature of the trapezoidal

block of the present invention comes from the blocks two part sidewalls 30, 31, FIG. 2.

As can be seen, the block body 20 generally has eight surfaces. The front surface 22 generally faces outward from the structure and may either have a plain or a roughened appearance to enhance the blocks aesthetic appeal. In fact, the block front surface 22 may be smooth, rough, planar or nonplanar, single faceted or multifaceted.

The back surface 24 of the block generally lies parallel to the front surface 22. The top surface 26 generally lies parallel to the bottom surface 28. As can be seen, FIG. 3, the upper surface has a greater depth across the block than the lower surface 28. Generally, the difference in depth between the upper surface 26 and the block lower surface 28 is attributable to the position of the flange 40, extending in part from the lower surface of the block, FIG. 3.

The block body sidewall surfaces 30, 31 lie across the width of the block, FIG. 2. The sidewalls of the block body of the present invention allow for the construction of straight structures or serpentine structures and more particularly outside radius turns. Accordingly, the block sidewalls are preferably of two-part construction. As can be seen in FIG. 2, the block sidewall first parts 34, 38 extend on either side of the block from the block front surface at an angle, alpha, of approximately ninety degrees toward the block back surface, FIG. 2.

Generally, at about one-fifth to about one-quarter of the depth of the block, the sidewall first part 38 joins the sidewall second part, FIGS. 2 and 3. The sidewall second part 32, 36 generally continue further towards the back surface 24 of the block body. Preferably, the sidewall second surfaces converge towards each other as these surfaces move towards the back surface of the block. The angle, beta, of the sidewall second preferably ranges in magnitude from about 30 degrees to about 60 degrees in relation to the block back surface, FIG. 2. This provides structures having a more aesthetically preferable or pleasing appearance by avoiding a "stepped" appearance which results from the adjacent placement of blocks having an extreme sidewall angle.

The two-part sidewalls allow for the construction of aligned, straight walls given the sidewall first part which aligns with adjoining sidewall first parts of blocks in the same wall course, (see 34, 38, FIG. 8). Optionally, the same embodiment of the block of the present invention allows the construction of aligned serpentine structure 45, FIG. 7.

Alternatively, the first part of the sidewall surfaces may have an angle, alpha, which is less than ninety degrees, FIGS. 4–6. This embodiment of the block of the present invention may more preferably be used in the construction of serpentine structures such as that shown in FIG. 7. In this instance, the block sidewall first part provides a block with a more aesthetically refined, rounded or multi-faceted front surface 22, FIG. 4. The sidewall second part in this embodiment of the block of the present invention also converge along angle, beta, towards the rear surface of the block allowing the construction of a structure similar to that shown in FIG. 7.

The block of the present invention also comprises a flange 40, FIGS. 3 and 6. The flange 40 assists in providing an effective interlocking mechanism which stabilizes the structures made in accordance with the present invention. Moreover, the block mold and method of molding blocks of the present invention allow the formation of block elements, such as flange 40, having high structural strength. The processing simultaneously affords the construction of interlocking elements having minimal size. The result of flanges having such minimal size is a structure having minimal setback and maximum stability given the weight and proportions of the blocks used.

The flange 40 may take any number of forms. Preferably, the flange 40 spans the width the blocks back surface 24 and extends from the block back surface beyond the height of the block. Generally, the flange 40 will extend beneath the lower surface of the block so that when stacked the flange 40 of each ascending block will hang over and lock onto the back surface of the block of the adjacent block in the next lowest course, FIG. 9.

The flange 40 may comprise any number of surfaces to aid in seating and locking the block in place. Preferably, the flange has a setback surface 42 and a locking surface 44. The setback surface generally adjoins and extends from the lower edge of the flange in a plane parallel to the block upper and lower surfaces. Adjoining the flange setback surface 42 and the block lower surface 28 is the flange locking surface 44, FIGS. 3 and 6.

The width of the setback surface determines the amount that the blocks of each successive course will setback from blocks from the next lower course. Generally, each successive course of blocks should setback far enough to maintain the stability of the soil behind the wall. In turn, flange 40 generally should be large enough to provide a high strength interlocking element, while remaining small enough to retain the stability of the wall. To this end, the width W of the setback surface 42, FIGS. 3 and 6, generally ranges in width from about 1 inch to about 2 inches across its base. This width range provides minimal setback while ensuring the provision of a strong flange.

In its most preferred mode, the block of the present invention is suitable for both commercial and residential use by landscapers as well as homeowners for use in building landscape structures. In this instance, the block generally weighs from about 50 lbs. to about 100 lbs. and more preferably 65 lbs. to 75 lbs. and has a height of about 3 inches to 12 inches, and more preferably 3 inches to 6 inches, a width of about 12 inches to about 18 inches, and more preferably 14 inches to 16 inches, and a length of about 6 inches to about 24 inches and more preferably 14 inches to about 16 inches. These measurements allow the maintenance of the appropriate weight to width ratio of the block, provide a block weighted to allow manual transport by one person, and ensures optimal efficiency in the use of machinery.

BLOCK STRUCTURES

The composite masonry block 15 of the present invention may be used to build any number of landscape structures. Examples of the structures which may be constructed with the block of the present invention are seen in FIGS. 7–9. As can be seen in FIG. 7, the composite masonry block of the present invention may be used to build a retaining wall 45 using individual courses 47 to construct to any desired height. The blocks may be stacked in an even pattern or an offset pattern depending on the intended application.

Generally, construction of a structure such as a retaining wall 45 may be undertaken by first defining a trench area beneath the plane of the ground 48 in which

to deposit the first course 49 of blocks, FIGS. 7 and 8. Once defined, the trench is partially refilled and tamped or flattened. The first course 49 of blocks is then laid into the trench, FIG. 8. The first course of blocks may often comprise blocks which are laid on their back in order to define a pattern or stop at the base of the wall. As can be seen in FIGS. 7-9, successive courses of blocks are then stacked on top of preceding courses while backfilling the wall with soil 48'. As stability is dependent upon weight and minimal setback, the minimal setback provided by the blocks of the present invention assists in further stabilizing even lighter weight blocks. This minimal setback adds to the stability of smaller size blocks by slowing the horizontal movement backward of the wall through the addition of successive courses.

As can be seen in FIGS. 7 and 8 the blocks of the present invention allow for the production of serpentine or straight walls. The blocks may be placed at an angle in relationship to one another so as to provide a serpentine pattern having convex and concave surfaces, FIG. 7. Moreover, depending on which embodiment of the block of the present invention is used, various patterns, serpentine or straight, may be produced in any given structure.

One benefit of the blocks of the present invention is their two part sidewall. While the first part of the side wall has a right angle in relationship to the front surface of the block 22, the second part of the block sidewalls converge or angle towards each other as the sidewall moves towards the back surface 24 of the block. The converging second part of the block sidewalls allows the blocks to be set in a range of angles relative to adjacent blocks of the same course, FIG. 7.

Moreover, when a straight wall is desired, FIG. 8, the blocks of the present invention allow for the placement of the blocks flush against each other. As can be seen in FIG. 8, block sidewall first part surfaces 38 and 34 of two adjacent blocks are flush against one another. This allows for the construction of a wall having tighter block placement.

In contrast, if a more highly angled serpentine wall is desired the block depicted in FIGS. 4-6 may be used. This block comprises sidewall first parts 34, 38 which have an angle and which may be less than 90°. As can be seen, the sidewalls first part 34, 38 effectively become the second and third faces along with the block front surface 22, of a three faceted front of the block. The lack of a 90° sidewall first part shortens the effective length of the block depicted in FIGS. 4-6. Thus, in angling the blocks of FIGS. 4-6 the length of the sidewalls first part 34, 38 does not become a factor block placement. As a result blocks of the same relative size and weight may be used more efficiently given limited space.

As can be seen in FIG. 8, a supporting matrix 42 may be used to anchor the blocks in the earth fill 48' behind the wall. One advantage of the block of the present invention is that despite the absence of pins, the distortion created by the block flange 40 anchors the entire width of the matrix 42 when pressed between two adjacent blocks of different courses, FIG. 9.

In this instance, a wall is constructed again by forming a trench in the earth. The first course 49 of the wall is seated in the trench and will be under soil once the wall is backfilled. The blocks 15 are placed on a securing mat or matrix 42 which is secured within the bank 48' by deadheads 44. The deadheads 44 serve as an additional stabilizing factor for the wall providing additional strength. The deadheads 44 may be staggered at given intervals over the length of each course and from course to course to provide an overall stability to the entire wall structure.

BLOCK MOLDING THE BLOCKS

An additional aspect of the present invention is the process for casting or forming the composite masonry blocks of this invention using a masonry block mold. Generally, the process for making this invention includes block molding the composite masonry block by filling a block mold with mix and casting the block by compressing the mix in the mold through the application of pressure to the exposed mix at the open upper end of the block mold. Formation of the block of the present invention is undertaken with a stepped mold to ensure that the pressure applied to the entire block 15 is uniform across the body 20 and flange 40.

An outline of the process can be seen in the flow chart shown in FIG. 10. Generally, the processes is initiated by mixing the concrete fill. Any variety of concrete mixtures may be used with this invention depending upon the strength, water absorption, density, and shrinkage among other factors desired for the given concrete block. One mixture which has been found to be preferable includes cementatious materials such as cement or fly ash, water, sand, and gravel or rock. However, other components including plasticizers, water proofing agents, cross-linking agents, dyes, colorants, pigments etc. may be added to the mix in concentrations up to 5 wt-% depending upon the physical characteristics which are desired in the resulting block.

Blocks may be designed around any number of different physical properties in accordance with ASTM Standards depending upon the ultimate application for the block. For example, the fill may comprise from 75 to 95% aggregate being sand and gravel in varying ratios depending upon the physical characteristics which the finished block is intended to exhibit. The fill generally also comprises some type of cementatious materials at a concentration ranging from 4% to 12%. Other constituents may then be added to the fill at various trace levels in order to provide blocks having the intended physical characteristics.

Generally, once determined, the fill constituents may be placed in any number of general mixers including those commonly used by those with skill in the art for mixing cement and concrete. To mix the fill, the aggregate, the sand and rock, is first dumped into the mixer followed by the cement. After one to two and one-half minutes, any plasticizers that will be used are added. Water is then introduced into the fill in pulses over a one to two minute period. The concentration of water in the mix may be monitored electrically by noting the resistance of the mix at various times during the process. While the amount of water may vary from one fill formulation to another fill formulation, it generally ranges from about 1% to about 6%.

Once the fill is mixed, the fill is then loaded into a hopper which transports the fill to the mold 50 within the block machine, FIGS. 11 and 12.

The mold 50 generally comprises at least four sides bordering a central cavity. As can be seen in FIG. 12, the mold generally has a front wall 58, a back wall 56, and a first 52 and second 54 opposing side. The opposing sides (52, 54) are each generally stepped in area 53 having a depressed center length (52', 54') and an ele-

vated higher end adjacent the front and back walls, FIG. 11. The central cavity 55 is bordered by these walls.

Core forms 62 may also be placed in the mold cavity 55 prior to loading the mold with block mix. Generally, the core forms 62 may be supported by bars 60 positioned across opposing first 52 and second 54 sidewalls and adjacent to the stepped regions 53 in each of these sidewalls.

Turning to the specific aspects of the mold, the mold functions to facilitate the formation of the blocks. Accordingly, the mold may comprise any material which will withstand the pressure to be applied to block fill by the head. Preferably, metals such as steel alloys having a Rockwell "C"-scale ranging from about 60–65 provide optimal wear resistance and the preferred rigidity. Generally, metals found useful in the manufacture of the mold of the present invention include high grade carbon steel 41–40 AISI (high nickel content, prehardened steel), carbon steel 40–50 (having added nickel) and the like. A preferred material includes carbon steel having a structural ASTM of A36.

The mold of the present invention may be made by any number of means known to those of skill in the art. Generally, the mold is produced by cutting the stock steel, patterning the cut steel, providing an initial weld to the patterned mold pieces and heat treating the mold. Heat treating generally may take place at temperatures ranging from 1000° F. to 1400° F. for 4 to 10 hours depending on the ability of the steel to withstand processing and not distort. After heat treating, final welds are then applied to the pieces of the mold.

Turning to the individual elements of the mold, the mold walls generally function according to their form by withstanding the pressure created by the press. Further, the walls measure the height and depth of the resulting blocks. Accordingly the mold walls must be made of a thickness which will accommodate the processing parameters of block formation given a specific mold composition. Preferably, the mold walls range in thickness from about 0.25 inch to about 2.0 inches, preferably from about 0.75 inch to 1.5 inches.

Additionally, the mold sidewalls function to ensure that uniform pressure is applied throughout the entire block during formation. Uniform pressure on all block elements is ensured by retaining additional block fill or mix adjacent the mold front 56 and back 58 wall in areas 55A and 55B, which will be the area in which the block flange 40 (FIGS. 3 and 6) is formed. By retaining mix in areas 55A and 55B, the same compression is applied to the mix which becomes the block body and to the mix which becomes the block flange. The application of uniform pressure to the block flange allows the construction of smaller blocks having smaller, stronger flanges. In turn, a smaller flange provides a block which results in a more vertical structure such as a wall having less setback from course to course and, as a result, greater stability over its height.

Generally, the mold sidewalls 52, 54 may take any form which provides this function. Preferably, the mold sidewalls 52, 54 are stepped 53 as can be seen in FIGS. 11 and 12. Turning to FIG. 11, mold sidewall 54 is stepped twice across its length in region 53 to create a depressed central length 54' in the sidewall 54. In FIG. 11, the mold 50 is shown during the actual block formation step, with the head 72 compressed onto the block fill in the mold 50.

The mold may preferably also comprise support bars 60 and core forms 62. The support bars 60 hold the core forms 62 in place and act as a stop for block fill or mix which is retained in the elevated (or stepped) region of the mold 50 thereby preventing the fill from flowing back into the area bordered by the depressed central lengths 52' and 54' of sidewalls 52 and 54. Here again, the support bars may take any shape, size material composition which provides these functions.

As can be seen more clearly in FIG. 12, support bar 60 is preferably long enough to span the width of mold 50 resting on opposing sidewalls 52 and 54. Preferably the support bars 60 are high enough to restrict the flow of fill into the central area of the mold cavity 55. Complementing this function, the support bars 60 are generally positioned in the depressed central areas 52' and 54' of the opposing sidewalls immediately adjacent stepped region 53, FIG. 12.

As can be seen in outline in FIG. 11, the core forms 62 are supported by bars 60 which span the width of the mold 50 resting on the opposing sidewalls 52, 54. The head 72 and head stamp 70 (also seen in outline (FIG. 11)) are patterned to avoid contact with the core forms 62 and support bars 60.

The core forms have a number of functions. The core forms 62 act to form voids in the resulting composite masonry block. In turn, the core forms lighten the blocks, reduce the amount of fill necessary to make a block and add a handle to the lower surface of the block which assists in transport and placement of the blocks. In concert with these functions the cores may take any number of forms. Preferably, the core forms are approximately three inches square and penetrate from about 60% to about 80% of the blocks height and most preferably about 70% to 80% of the block height. Also preferred, as can be seen in the exploded view provided in FIG. 13, the core forms 62 are affixed to the support bar 60 at insert regions 60A. These insert regions 60A assist in positioning the cores and during processing, reduce the build up of block mix or fill on the lower edge of the support bar 60. In turn, maintaining a support bar 60 clean of mix build up maintains the planarity of the lower surface of blocks formed in accordance with the present invention.

In operation, the mold 50 is generally positioned in a block molding machine atop a removable or slidable substrate 80, FIG. 13. The support bars 60 and core forms 62 are then placed into the mold 50. The mold 50 is then loaded with block mix or fill. As configured in FIG. 12, the mold 50 is set to form two blocks simultaneously in "siamese" pattern. As will be seen, once formed and cured, the blocks may be split along the edge created by flange 51 generally along axis A.

Prior to compression the upper surface of the mold 50 is scraped or raked with a feed box drawer (not shown) to remove excess fill. Scraping of the mold is preferably undertaken in a side-to-side direction in order to avoid contact with the side bars 60. Also, removal of the excess fill from the mold by scraping from the side allows for the depressed central lengths 52' and 54' of the mold and does not disturb the fill at the stepped ends of the mold 50.

The mold is then subjected to compression directly by head 70 (shown in outline complete in FIG. 11 and in perspective in FIG. 13). Preferably the head 70 is patterned 74 to avoid the support bars 60 and core forms 62. Also, as can be seen in FIG. 13, the head 70 preferably has an instep 75 which shape complements and

results in, the formation of the block flange 40. Instead of relying on the head to force block fill towards either end of the mold 50 into instep 75 to create a flange, the mold 50 maintains fill in the stepped regions at either end of the mold 50. The fill in these regions comes into direct contact with instep 75 immediately upon lowering of the head 70. As a result, the fill in this stepped area is subjected to the same pressure as the fill in other areas of the mold. This results in a flange 40 of the same structural strength as the other elements of the block 15.

Once the mold has been filled, leveled by means such as a feed-box drawer, and agitated, a compression mechanism such as a head converges on the exposed surface of the fill. The head acts to compress the fill within the mold for a period of time sufficient to form a solid contiguous product. The head 70, as known to those of skill in the art, is a unit which has a pattern which mirrors the blocks and core forms 62 and is complementary to that of the mold 50. Generally, the compression time may be anywhere from ½ to 3 seconds and more preferably about 1.5 to about 2 seconds. The compression pressure applied by the head ranges from about 5000 to 8000 psi and preferably is about 7500 psi. Once a compression period is over, the head in combination with an underlying pallet 80 acts to strip the blocks 15 from the mold 50. At this point in time, the blocks are formed. Any block machine known to those of skill in the art may be used. One machine which has been found useful in the formation of blocks in accordance with the present invention is a Besser V-3/12 block machine.

Prior to compression the mold may be vibrated. Generally, the fill is transported from the mixer to a hopper which then fills the mold 50. The mold is then agitated for up to two or three seconds, the time necessary to ensure that the fill has uniformly spread throughout the mold. The blocks are then formed by the compressing action of the head.

Once the blocks are formed, they may be cured through any means known to those of skill in the art. Curing mechanisms such as simple air curing, autoclaving, steam curing or mist curing, are all useful methods of curing the block of the present invention. Air curing simply entails placing the blocks in an environment where they will be cured by the open air over time. Autoclaving entails placing the blocks in a pressurized chamber at an elevated temperature for a certain period of time. The pressure in the chamber is then increased by creating a steady mist in the chamber. After curing is complete the pressure is released from the chamber which in turn draws the moisture from the blocks.

Another means for curing blocks is by steam. The chamber temperature is slowly increased over two to three hours and then stabilized during the fourth hour. The steam is gradually shut down and the blocks are held at the eventual temperature, generally around 120°-200° F. for two to three hours. The heat is then turned off and the blocks are allowed to cool. In all instances, the blocks are generally allowed to sit for twelve to twenty-four hours before being stacked or stored. Critical to curing operations is a slow increase in temperature. If the temperature is increased too quickly, the blocks may "case-harden." Case-hardening occurs when the outer shell of the blocks hardens and cures while the inner region of the block remains uncured and moist. While any of these curing mechanisms will work, the preferred curing means is autoclaving.

Once cured, the blocks may be split if they have been cast "siamese" or in pairs. Splitting means which may be used in the method of the present invention include a manual chisel and hammer as well as machines known to those with skill in the art for such purposes. Splitting economizes the production of the blocks of the present invention by allowing the casting of more than one block at any given time. When cast in pairs, the blocks 15, FIG. 13, may be cast to have an inset groove created by flange 51 on their side surfaces between the two blocks. This groove provides a natural weak point or fault which facilitates the splitting action along axis A'. The blocks may be split in a manner which provides a front surface 22 which is smooth or coarse, single-faceted or multi-faceted, as well as planar or curved. Preferably, splitting will be completed by an automatic hydraulic splitter. Once split, the blocks may be cubed and stored.

The above discussion, examples, and embodiments illustrate our current understanding of the invention. However, since many variations of the invention can be made without departing from the spirit and scope of the invention, the invention resides wholly in the claims hereafter appended.

We claim as our invention:

1. A retaining wall comprising at least a first lower course and a second upper course, each of said courses comprising one or more composite masonry blocks, each of said masonry blocks comprising:

(a) a block body, said block body comprising a front surface and a back surface separated by a distance comprising the depth of the block, an upper surface and a lower surface separated by a distance comprising the height of the block, and first and second sidewall surfaces adjoining said block upper and lower surfaces—both said first and second sidewall surfaces each comprising a first and second part, said sidewall first part surfaces extending from said block front surface towards said block back surface at an angle of no greater than ninety degrees in relationship to said block front surface, said sidewall second part surface adjoining and lying between said sidewall first parts and said block back surface; and

(b) a flange affixed to the block adjacent said rear surface and extending downwardly from said block body, said flange comprising a locking surface adapted to nest with the next lowest course of blocks, said locking surface extending downwardly from the plane of said block lower surface;

said wall further comprising at least one anchoring matrix interposed between a portion of at least said first course block and a portion of at least said second course block wherein the lower surface of said second course block is positioned on top of the upper surface of said first course block, the block flange of said second course block being positioned adjacent and behind the block back surface of said first course block, said anchoring matrix is distorted by said second course block flange and said matrix is fixed in position between the first and second courses by the distorted interposition of said matrix between said first and second course blocks and the weight of said second course.

2. The retaining wall of claim 1 wherein said retaining wall masonry blocks comprise sidewall first part surfaces extending from said block front surface towards said block back surfaces at an angle of less than ninety degrees in relationship to said block front surface.

3. The retaining wall of claim 2 wherein said wall comprises at least one anchoring matrix positioned be-

tween at least two adjacent blocks of two difference courses.

4. The wall of claim 2 wherein said wall has a serpentine pattern.

5. The retaining wall of claim 1 wherein the block of said first course is vertically offset from the block of said second course.

6. The retaining wall of claim 1 wherein said block body lower surface has a smaller area than said block body upper surface.

7. The retaining wall of claim 1 wherein said retaining wall blocks comprise a block body having a first and second side wall separated by a distance comprising the width of the block, said block flange spanning the width of said block back surfaces.

8. The retaining wall of claim 1 wherein said block body front surface is concave.

9. The retaining wall of claim 8 wherein said wall has a serpentine pattern.

10. The retaining wall of claim 1 wherein said block body front surface is substantially planar.

11. The retaining wall of claim 1 wherein said block body front surface is faceted.

12. The retaining wall of claim 1 wherein said block flange comprises a set back surface, said set back surface extending from said flange in a plane parallel to the block upper and lower surfaces and towards said block front surface to adjoin said flange locking surface.

13. A retaining wall comprising at least a first lower course and a second upper course, each of said courses comprising:

(a) one or more composite masonry blocks, each of said blocks comprising a block body comprising a front surface and a back surface separated by a distance comprising the depth of the block, an upper surface and a lower surface separated by a distance comprising the height of the block, and first and second sidewall surfaces adjoining said block upper and lower surfaces, said upper and lower surfaces adjoining said front and back surfaces, and said front and back surfaces adjoining said first and second sidewall surfaces, wherein each of said surfaces meet to form an edge and wherein at least said second upper course block comprises a flange adjacent said second course block back surface extending downwardly from said second course block lower surface, said flange comprising a locking surface adapted to nest with an edge of a block in the next lower course; and

(b) at least one anchoring matrix interposed between a portion of said first course block and a portion of said second course is positioned on top of the upper surface of said first course block, the back edge of said first course block being nested against the flange locking surface of said second course block, said anchoring matrix being distorted by the locking surface of said second course block and said matrix being fixed in position between the first and second course blocks by the distorted interposition of said matrix between said first and second course blocks.

14. The retaining wall of claim 13 wherein said wall has a serpentine pattern.

15. The retaining wall of claim 13 wherein said block body lower surface has a smaller area than said block body upper surface.

16. The retaining wall of claim 13 wherein said block body front surface is concave.

17. The retaining wall of claim 13 wherein said block body front surface is substantially planar.

18. The retaining wall of claim 13 wherein said block body front surface is faceted.

19. The retaining wall of claim 13 wherein said block flange comprises a set back surface, said set back surface extending from said flange in a plane parallel to the block upper and lower surfaces and towards said block front surface to adjoin said flange locking surface.

20. The retaining wall of claim 13 wherein said first lower course block comprises a flange adjacent said first course block back surface and extending downwardly from said first course block lower surface, said flange comprising a locking surface adapted to nest with an edge of an adjacent block.

* * * * *

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United States Patent [19]

Gravier

[11] Patent Number: 5,484,236

[45] Date of Patent: Jan. 16, 1996

[54] METHOD OF FORMING CONCRETE RETAINING WALL BLOCK

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[73] Assignee: Allan Block Corporation, Edina, Minn.

[21] Appl. No.: 142,715

[22] Filed: Oct. 25, 1993

[51] Int. Cl.[5] F02D 29/02

[52] U.S. Cl. 405/286; 52/592.6; 52/609; 405/262; 405/284

[58] Field of Search 405/262, 284, 405/285, 286; 52/609, 608, 593, 589

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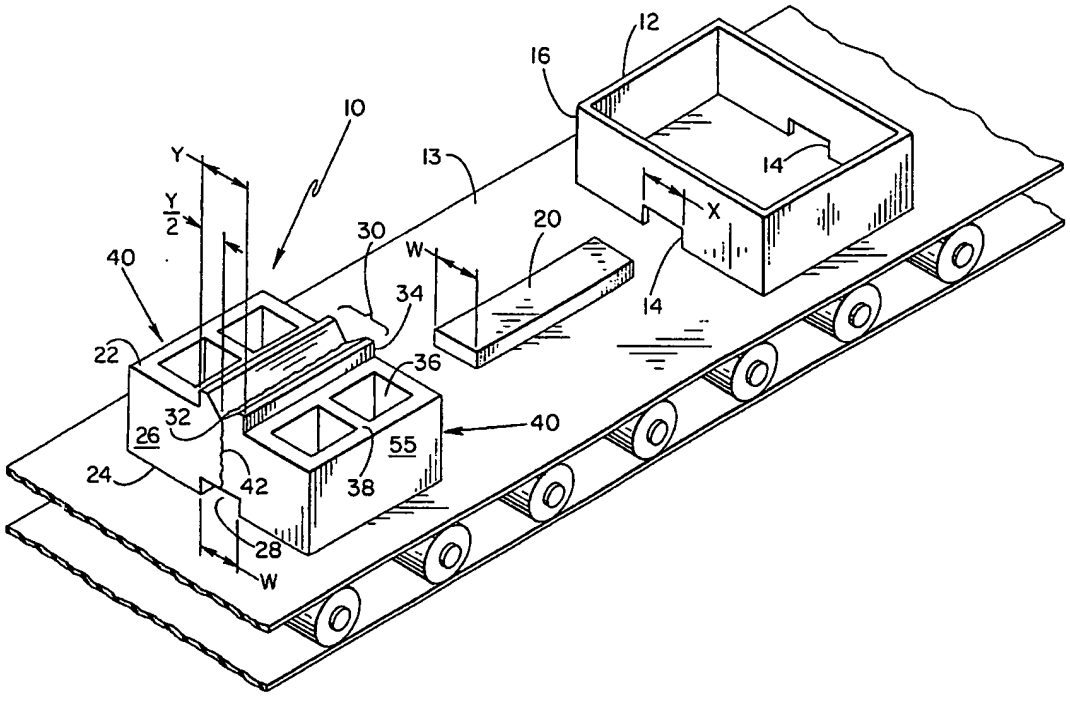
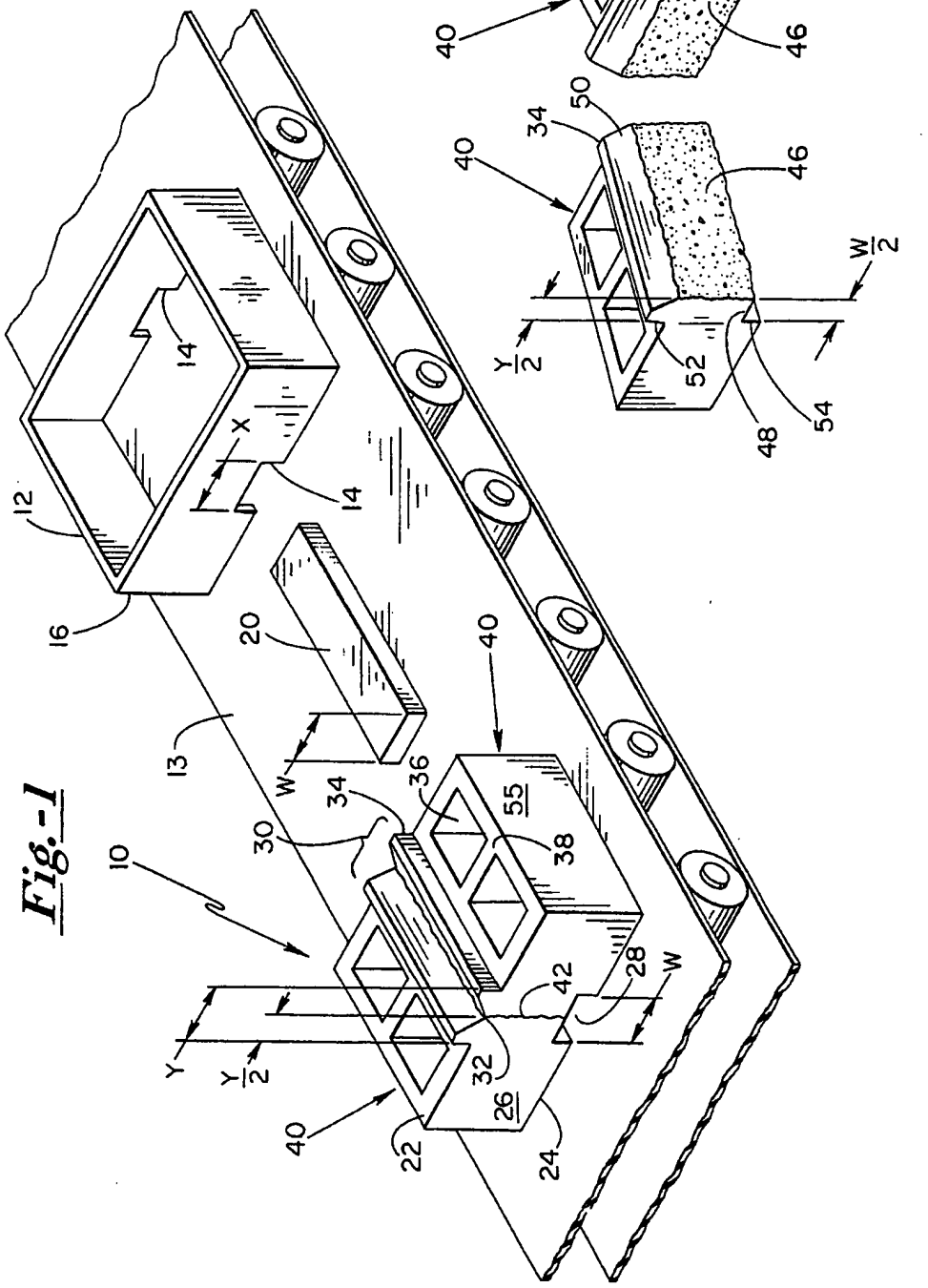
Primary Examiner—Dennis L. Taylor
Attorney, Agent, or Firm—Haugen and Nikolai

[57] ABSTRACT

A method for forming concrete retaining wall blocks from a single mold with selectable dimensions such that a retaining wall of a desired setback can be defined. One of a plurality of core bars is implemented with the mold during the manufacturing process to define a laterally extending rectangular recess of a predetermined width across the lower major surface of a composite block. Subsequently, the composite block is split along a midsection thereof to form a pair of identical blocks, each block having a laterally extending front lip and a laterally extending lower recess. The depth of the recess determines the setback of a retaining wall formed therefrom. The shallower the dimension of the lower recess, the greater the setback of the individual rows forming the retaining wall formed therefrom. Further, the present method facilitates creating a pair of blocks with a textured front surface to provide an aesthetically pleasant retaining wall. A plurality of core bars are available with different widths, and are used to form retaining wall blocks adapted to define retaining walls with varying setbacks ranging from 0° (vertical) to 12°. The core bars can have a rectangular or trapezoidal cross section. Each formed retaining wall block has core openings to reduce the weight thereof.

17 Claims, 3 Drawing Sheets

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Y/2

Fig.-1

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50
52
54
55
W/2
Y/2

Fig.-2

Fig.-3

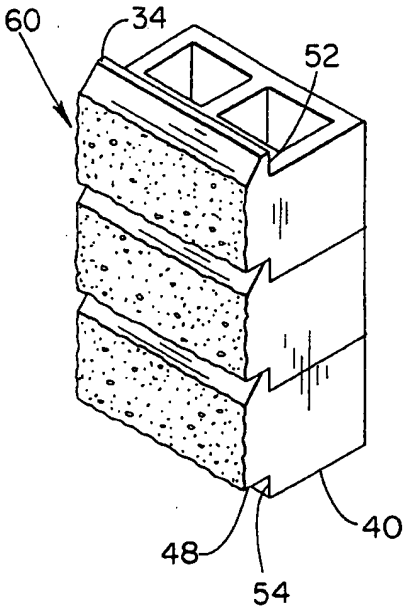


Fig.-4

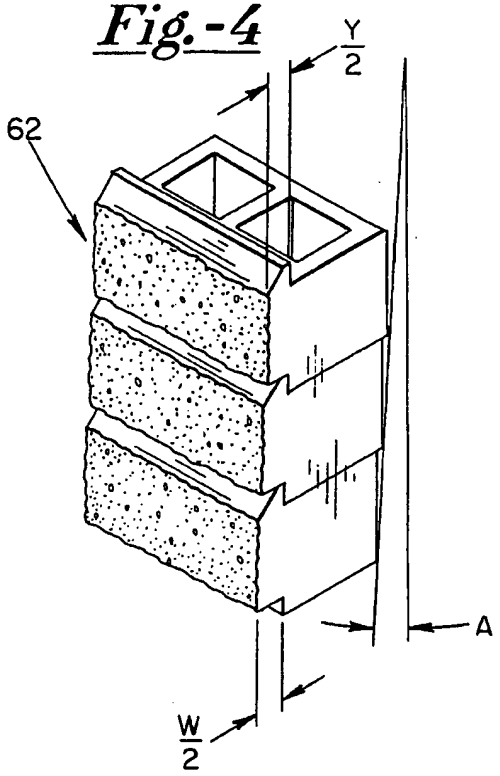


Fig.-5

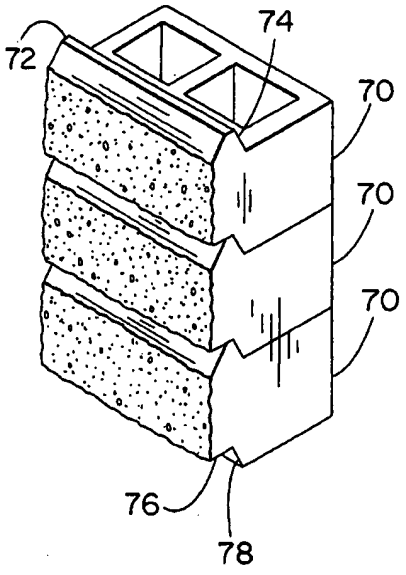
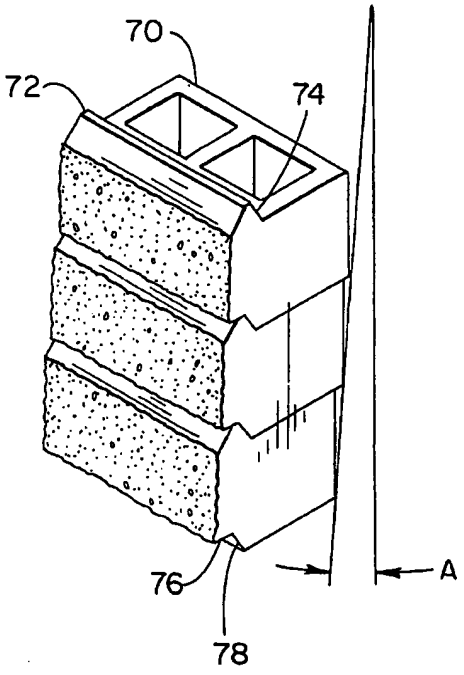


Fig.-6



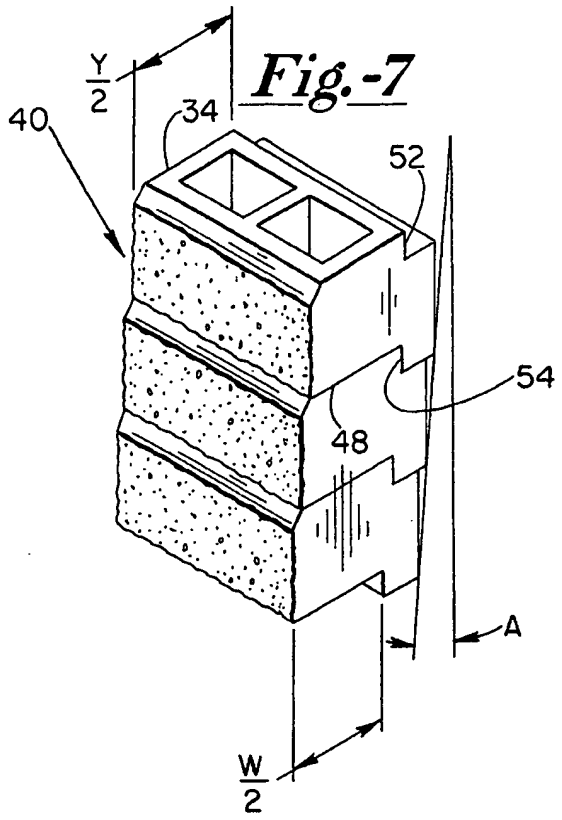
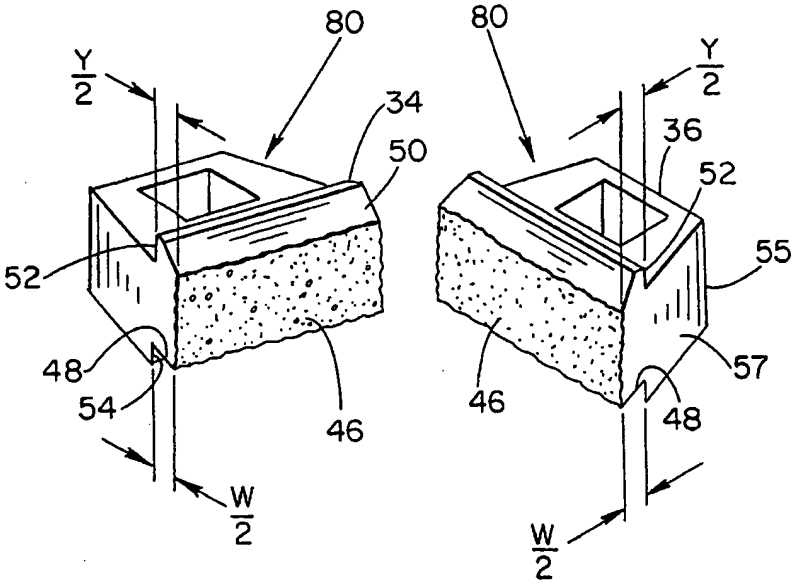

Y/2
34
40
52
54
48
A
W/2

Fig.-7

Fig.-8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METHOD OF FORMING CONCRETE RETAINING WALL BLOCK

BACKGROUND OF THE INVENTION

I. Field of the Invention

This invention is related generally to the construction of retaining wall blocks, and more particularly to a unique method of forming a pair of identical blocks each with a raised front lip and a lower front recess, the depth of which lower recess can be selectively defined during the manufacturing process to correspond to the setback angle of a retaining wall which can be constructed from the block.

II. Discussion of the Prior Art

Retaining walls are commonly employed to retain highly positioned soil, such as soil forming a hill, to provide a usable level surface therebelow such as for playgrounds and yards, or to provide artificial contouring of the landscape which is aesthetically pleasant. Retaining wall systems are typically designed to have a "setback" at an angle to counter the pressure of the soil disposed behind the wall. Setback is generally considered to be the distance in which one course of a wall extends beyond the front of the next highest course of the same wall. However, setback is not always required for a wall of moderate height, and further, may not be appropriate when constructed close to lot lines, utilities, trees, or structures already in place. Thus, a method of manufacturing retaining wall blocks which accommodates selectively creating blocks of different dimensions such that the blocks can be used to form retaining walls with setbacks from 0° to 12° would be valuable to accommodate the needs of various applications.

It is known in the prior art to form blocks in pairs, whereupon a composite block is split to form a pair of substantially identical blocks to economize the production of the blocks. Further, splitting a composite block allows the formation of an irregular and aesthetically pleasant textured front surface for each of the blocks defined. Thus, splitting a molded composite block has the dual function of facilitating an economical method of producing multiple blocks from a single mold, and which blocks have an aesthetically pleasant exposed front surface.

U.S. Pat. No. 4,909,010 which is assigned to the assignee of the present invention discloses a novel block having a textured front surface, and which is ideal for constructing retaining wall systems with a setback. The blocks interlock to create a strong barrier wall. The setback is determined by the thickness of the front lip. The blocks are formed in pairs by splitting a single molded block. There is no lower channel defined in the molded block, thus, a wall cannot be built with no setback. There is also no method disclosed of using a single mold to define blocks of different shapes and dimensions.

U.S. Pat. No. 5,017,049 to Sievert teaches a composite masonry block which facilitates creating a retaining wall with setback, and which blocks are formed in pairs by splitting a block along a midsection thereof to define a pair of substantially identical blocks. A pair of longitudinally extending grooves are defined parallel to each other, one defined in the upper major surface and the other in the lower major surface of the block. Upon splitting the block, a pair of substantially identical blocks are formed, each having a textured front surface. A pair of opposing flanges are defined on the composite block such that upon splitting, each formed block will have a downwardly extending rear flange to facilitate establishing a predetermined setback. The method

taught includes filling the mold cavities in a manner which provides for casting the blocks on their sides. The method taught by this patent facilitates creating blocks in an economical manner, but fails to teach a method of forming a block with selectively defined dimensions, and from a single mold such that the blocks can ultimately form retaining walls with a chosen setback, or with no setback at all.

U.S. Pat. No. 5,031,376 to Bender et al. teaches retaining wall construction and blocks which are also formed in pairs. During manufacturing, a pair of grooves are defined parallel to another, one disposed in each of the major surfaces to facilitate the splitting procedure. A pair of opposing flanges are defined in the upper major surface at opposite ends thereof, which flanges form a front lip to facilitate a retaining wall with a setback. This block and a method of manufacturing thereof does not facilitate selectively defining dimensions of a retaining wall block using a single mold, which blocks can be used to form a retaining wall with a desired setback, or no setback at all. The face proximate the lip is not textured.

U.S. Pat. No. 4,920,712 to Dean, Jr. teaches a concrete retaining wall block which is formed in pairs by splitting a larger block along the midsection thereof, wherein the front and exposed surface of the block is visible when stacked to form a retaining wall. However, there is no method of manufacturing taught using a single mold wherein the block dimensions can be selectively defined to facilitate creating a retaining wall with a selected setback, or no setback at all.

U.S. Pat. No. 5,214,898 to Beretta teaches a block for building retaining walls having a lip and groove arrangement such that the block can be stacked to form a retaining wall with no setback at all. However, there is no method of manufacturing taught wherein the block dimensions can be selectively defined using a single mold such that the blocks can be used to form a retaining wall with a selected setback, nor is there a method of manufacturing taught wherein the blocks are formed in pairs.

OBJECTS

It is accordingly a principle object of the present invention to provide a method of manufacturing a pair of retaining wall blocks from a single mold wherein the block dimensions can be custom defined such the blocks are adapted to form a retaining wall with a desired setback.

It is a further object of the present invention to provide a method of manufacturing a retaining wall block wherein the blocks can be assembled to form a retaining wall with a setback of from 0° to 12°.

Still yet a further object of the present invention is to provide a method of manufacturing a pair of retaining wall blocks wherein each has a textured exposed face when assembled into a wall and thus an aesthetically pleasant appearance.

Another object of the present invention is to provide a method of forming a variety of block shapes, including rectangular and trapezoidal shaped blocks, in pairs.

Other objects, features and advantages of the present invention will become apparent to those skilled in the art through the Description of the Preferred Embodiment, claims, and drawings herein wherein like numerals refer to like elements.

SUMMARY OF THE INVENTION

The foregoing objects and advantages of the present invention are achieved by providing a method of manufac-

turing a pair of retaining wall blocks wherein a molded composite block is formed with a major upper surface having a ridge laterally extending thereacross, and a lower major surface having a custom defined notch laterally extending thereacross, wherein the upper ridge and lower notch are parallel to one another. The composite block is split across the midsection thereof to bisect the upper ridge and lower notch, and a pair of identical blocks are formed. Each block has a textured exposed front surface, and a laterally extending upper lip and lower recess such that the blocks, when assembled, form a retaining wall with a preselected setback.

More specifically, a single mold is implemented wherein the width of the laterally extending notch is custom defined at the time of manufacturing and before splitting the molded block such that when the blocks are stacked after splitting, the lip of the lower block will mate with the lower recess of the block stacked thereupon. The width of the block recess stacked thereon will determine the setback of the wall to be assembled. The shallower the front recess of each block, the greater the setback of the retaining wall. The width of the lip remains fixed while the width of the recess can vary.

To selectively define the width and shape of the laterally extending notch in the molded block during the time of manufacture, a core bar of a chosen width and shape is used in combination with a single mold to define the laterally extending notch at an identical width. Thus, a single mold can be used with any of a number of core bars, each bar having an appropriate width and shape. A rectangular or trapezoidal shaped core bar is preferred.

During the molding process, the single composite block is first molded with the laterally extending ridge including a longitudinal V-shaped notch extending along the center thereof to bisect the ridge into a pair of lips. After curing, the block is then split through the center of this ridge V-shaped notch and through the center of the lower lateral extending notch such that a pair of blocks each with a front lip with a beveled front surface are defined. The beveled upper lip and textured front surface of each formed block adds to the aesthetic appearance of a formed retaining wall created therefrom. Further, to reduce the weight of each block, a pair of vertically extending cores or hollows are defined in the molded block to each side of the laterally extending ridge, which cores are separated by a core reinforcement portion. This hollowed core arrangement reduces the weight per square foot of the retaining block yet provides sufficient reinforcement strength. More than one shape of blocks can be realized using the method of the present invention, including rectangular and trapezoidal shaped blocks.

In summary, the present invention is directed towards a method of manufacturing a pair of retaining wall blocks with a textured front surface, wherein the block dimensions can be selectively defined while using a single mold before splitting such that the formed blocks will realize a retaining wall with a predetermined selected setback when stacked.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a mold box, core bar and a composite block formed therefrom according to the process of the present invention residing on a conveyor belt;

FIG. 2 is a perspective view of two identical rectangular blocks formed by splitting the composite block of FIG. 1;

FIG. 3 is a perspective view of a retaining wall system with no setback formed from blocks shown in FIG. 2;

FIG. 4 is a perspective view of a retaining wall system with a setback corresponding to the width of the selectively defined lower recess of the block shown in FIG. 2;

FIG. 5 and 6 is a perspective view of a retaining wall system without and with setback, respectively, wherein the block lip and recess are tapered;

FIG. 7 is a perspective view of a retaining wall system formed from blocks manufactured with a large recess such that the blocks have a rear lip; and

FIG. 8 is a perspective view of two identical trapezoidal blocks formed by splitting a composite block according to the process of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to FIG. 1 is shown a cured composite block **10** which is cast from a single mold **12** using a process well-known in the art. This process for making the present invention includes block molding the rectangular composite masonry block **10** by filling rectangular block mold **12** with mix and casting the block by compressing the mix in the mold through the application of pressure to the exposed mix at the open upper end of the block mold. Additional discussion of this well-known method is provided in U.S. Pat. No. 5,017,049, the teachings of which are incorporated herein by reference.

The novel features of the present method for manufacturing retaining wall blocks can be appreciated in view of the particular features of mold **12** shown placed on a standard conveyor belt **13**. Specifically, mold **12** is comprised of a rectangular structure having an open top and bottom and with a rectangular opening **14** defined in each of opposing sides **16** of mold **12**. Each rectangular opening **14** is defined at a center lower portion of each respective side wall **16**. Each opening **14** has a predetermined width dimension "X", as shown. An accessory to mold **12** implemented in combination therewith is a core bar **20**. Core bar **20** is comprised of a longitudinally extending rectangular member having a width dimension "W", as shown. However, core bar **20** could have a trapezoidal shape as well to provide tapered surfaces (see FIG. **7**). Prior to the molding process, core bar **20** is disposed longitudinally such that it extends through both openings **14** and is centered therewithin as will be appreciated shortly. A plurality of core bars **20** are available to be implemented with mold **12**, each having a different width "W". However, the width dimension "W" of bar **20** is less than or equal to the width dimension "X" of each opening **14**. Core bar **20** defines a laterally extending notch **28** extending across the lower major surface of block **10** including the width thereof as will now be discussed in greater detail.

Still referring to FIG. **1**, composite block **10** can be seen to be formed from mold **12** as a rectangular block with an upper major surface **22** and an opposing lower major surface **24**. Block **10** has a pair of opposing major sides **26**, wherein a laterally extending notch **28** extends therebetween along a center of block **10** to bisect block **10**. Notch **28** is formed by the selected core bar **20** disposed through openings **14** of mold **12** during the molding process. Subsequently, when core bar **20** and mold **12** is removed from the formed block **10** notch **28** is defined. Accordingly, the width "W" of notch **28** is identical to the width "W" of the associated core block **20** used during the molding process. The width of notch **28** can be selectively determined during the molding process by choosing the appropriate core bar **20** with a selected width

"W". The width "W" of notch **28** directly corresponds to a setback which is established when the blocks formed are stacked and assembled into a retaining wall, as will be discussed shortly.

Block **10** can also be seen to include a laterally extending ridge **30** extending between the opposing major walls **26** along a center thereof to bisect block **10**, which ridge **30** is parallel to and vertically defined above laterally extending notch **28**. Ridge **30** is further defined as having a V-shaped notch or groove **32** extending the length thereof and bisecting ridge **30** into a pair of lips **34**. To reduce the weight of block **10** and the pair of blocks defined therefrom, a pair of vertically extending core openings or hollows **36** are provided each side of ridge **30**, each opening **36** extending from upper major surface **22** to major lower surface **24** of block **10**. A core reinforcement portion **38** is perpendicularly defined between each respective pair of openings **36** as shown.

Ridge **30** is particularly characterized as having a predetermined width dimension "Y", wherein the width of each lip **34** has a dimension "Y/2". Thus again, elongated V-shaped notch **32** bisects ridge **30** into a pair of identical elongated lips **34**. The dimension "Y" remains fixed as the dimension "W" is selectively defined.

Once cured, block **10** is split into a pair of identical rectangular blocks **40**. Block **10** is split along line **42**, which splitting process can include a manual chisel and hammer as well as machines known to those with skill in the art for such purposes. This splitting process in combination with the symmetrical features of block **10** including lips **34** and lateral extending notch **28** facilitates an economical production of the blocks since only one casting process is required to form two blocks. Further, the present process facilitates creating a pair of identical blocks **40** with a textured front surface which is exposed and visible when the blocks are assembled to form a retaining wall. This textured surface is aesthetically pleasant and adds to the attractiveness of the retaining wall formed. According to the present invention, the pair of blocks **40** formed after the splitting procedure each have a textured front surface with a lateral extending upper lip **34** and the laterally extending lower recess **48** having a depth of "W/2", as can be seen in FIG. **2**.

Referring now to FIG. **2**, the pair of blocks **40** formed from the previously discussed method can be seen. Each block **40** has a textured front surface **46** with laterally extending lip **34** disposed thereabove. A laterally extending rectangular recess **48** extends thereunder and has a depth of "W/2", which is half the width dimension "W" of the core bar **20** used and notch **28** originally formed in block **10** and shown in FIG. **1**. Again, the width of recess **48** will define the setback of the retaining wall to be formed as will be discussed shortly. Also seen in FIG. **2** is a smooth beveled surface **50** of each laterally extending lip **34** which is formed as a result of V-shaped notch **32** originally defined in block **10** and discussed in reference to FIG. **1**. The back surface **52** of each lip **34** is smooth and vertical with respect to the upper major surface of block **40**. Similarly, the vertical surface **54** of recess **48** is smooth as well and in combination with surface **52** provides for a tight fitting wall system and fast installation.

In an alternative embodiment, block **10**, can be cast to have a generally diamond or hexagon (six-sided) shape and profile such that a pair of trapezoidal blocks **80** are formed after the splitting process. (See FIG. **8**). For instance, the opposing distal walls **55** of the block **10** would be shorter in length than textured front wall **46**, and the side walls **57** at each block **40** would taper rearwardly and inwardly to respective shorter rear wall **55** to define a trapezoidal block **80** suited for forming curved retaining walls. Hence, limitations to defining a rectangular block **10** and a pair of rectangular blocks **40** is not to be inferred using the method of the present invention.

Turning now to FIG. **3** and **4**, the novel features of the present method using a single mold **12** can be appreciated in view of retaining walls formed by stacking a plurality of blocks **40** manufactured from the method of the present invention. As shown in FIG. **3**, a vertically extending wall **60** with no setback can be formed when the width "W/2" of recess **48** is defined to be equal to the width of lip **34** having a dimension "Y/2". In other words, the block **10** formed in FIG. **1** has a ridge with a width "Y" equal in dimension to width "W" of laterally extending notch **28**.

To further appreciate the features of the present method, using a single mold **12**, a retaining wall **62** can be formed such as shown in FIG. **4** with a setback having an angle "A". The retaining wall **62** is formed from blocks by defining recess **48** such that it has the depth which is less than the width of the lip **34**. In other words, the depth "W/2" of recess **48** is less than the width dimension "Y/2" of lip **34**. Thus, when blocks **40** are stacked the front exposed textured surface **46** of each block will be offset rearwardly, as shown, in a staggered arrangement. In other words, the front surface **46** of each block **40** will be offset slightly rearwardly from the front surface **46** of the block disposed thereunder. The offset distance is equal to the difference between the dimension W/2 and the dimension Y/2 (OFFSET=W/2–Y/2), which corresponds to the width of recess **48** and lip **34**, respectively. Thus, the greater the difference between the dimensions of recess **48** and lip **34**, the greater the offset angle "A".

Accordingly, one of the novel features of the present method invention is that the offset of a retaining wall to be formed from the manufactured blocks **40** can be selectively determined at the time of molding block **10** by implementing the appropriate core bar **20**. Further, a single mold **12** is used to manufacture a block **10** having a lateral extending notch **28** of a selectable predetermined width "W". The width "W" of core bar **20** directly corresponds to this setback "A" defined when the blocks **40** are stacked, where front surface **54** of each recess **48** is securingly abutted against the back surface **52** of the corresponding lip **34** of the block disposed thereunder. When stacked, a structurally sound retaining wall is formed with a predetermined setback, or no setback at all.

Referring now to FIGS. **5** and **6**, a retaining wall formed from blocks using an alternative preferred embodiment of the present method is shown wherein a pair of blocks **70** can be formed from each single composite block, wherein each block **70** has a lip **72** with a tapered rear surface **74**. Each laterally extending notch of the composite block is formed to have a trapezoidal shape and which is formed from a corresponding trapezoidal shaped core bar (not shown). Thus, each block **70** has a recess **76** with a tapered wall **78**. When the blocks **70** are stacked such as shown in FIGS. **5** and **6**, the tapered surfaces **74** and **78** of the corresponding recesses **76** and ridges **72**, respectively, are conforming and abut one another. This additional beveled feature of the ridge and recess provides a better bond to occur between the raised lip **72** and the rest of the block by eliminating a suction-like force which occurs during production. This method also provides for improved block quality and faster rates of production.

While the method disclosed for forming blocks is the preferred embodiment, it is to be recognized that block **10** or

70 could be formed with a laterally extending ridge **30** and without any laterally extending groove **32** at all such that the front of each formed block would be comprised of a single textured planar surface. Thus, when assembled into a retaining wall with no setback whatsoever, a retaining wall with a continuous textured surface would be formed. The present method invention is primarily directed to selectively defining the shape and width "W" of lateral extending notch **28** at the time of molding, which width dimension is chosen to correspond to a desired setback which will be formed when the blocks are stacked. V-shaped notch **32**, which could also comprise of any other shapes if desired such as a semi-circle, facilitates the splitting process, and further, provides for an aesthetically pleasant beveled lip which can be appreciated when a retaining wall is formed therefrom. Moreover, the width of lip **34** and **72** could be selectively defined as well with the width of the recess **48** and **78** remaining fixed, respectively, to choose setback.

The preferred method invention disclosed realizes retaining wall blocks with an upper forward lip and a lower front recess which provides creating a sound structure which is not susceptible to shifting once embedded in an embankment. Thus, shifting of the retaining wall blocks once integrated into a retaining wall is inhibited.

The width "W/2" of each recess **48** is preferably substantially smaller than the width of the remaining bottom surface of each block **40**, as shown in FIG. **2**. The width "W/2" of each recess **48** is preferably selectively defined in the range of from 2" to 4", however, limitation to this particular range of dimensions is not to be inferred. The dimension "Y/2" of each lip **34** is preferably defined as about 1½". The width "W" of the various core bars **20** adapted to be used with mold **12** vary in width from 4" to 8". Accordingly, the width dimension "X" of each opening **14** in mold **12** is 8", which is the maximum width available to be defined as the width of laterally extending notch **28** in block **10**. Again, limitation to these dimensions is not to be inferred, and are provided by way of illustration. For instance, the width dimension "W" could be large relative to the depth of the block itself such that the block is essentially a rear-lip design, as shown in FIG. **7**. Thus, limitation to a range of width "W" is not to be inferred, but rather, is limited only to the chosen dimension "X" of mold **12** and can be defined large to accommodate a rear-lip design. Thus, the shape of the block system can vary with the concept still intact. Neither the dimensions or shape of the block need be limited. This method is conventionally applied to the concrete block production industry, and the larger scale "wet or pre-cast" industry. Finally, the block, can take on either a solid or hollow configuration, and limitation to defining hollows **36** is not to be inferred.

Preferably, mold block **12** has the dimensions of 8"×16"×24". Thus, each core bar **20** has a length dimension of at least 16" as well, and each identical block **40** has a depth of 12". Automatic manufacturing techniques are adapted to be used with the present method where a core-bar puller is used to position each core bar **20** to mold box **12** before and after the molding process. Thus, core bar **20** can be inserted either by hand or by machine to mold box **12** before disposing a block into mold **12** for processing. As shown in FIG. **1**, the present invention is ideally performed on a conveyor belt to facilitate a high volume output.

This invention has been described herein in considerable detail in order to comply with the Patent Statutes and to provide those skilled in the art with the information needed to apply the novel principles and to construct and use such specialized components as are required. However, it is to be understood that the invention can be carried out by specifically different equipment and devices, and that various modifications, both as to the equipment details and operating procedures, can be accomplished without departing from the scope of the invention itself.

I claim:

1. A method of creating a construction block adapted to form retaining walls or the like, comprising the steps of:

(a) forming a member having a major upper surface and major lower surface and a plurality of edges, said upper major surface having a ridge extending laterally across a midsection thereof between an opposed pair of said edges with said ridges extending upwardly and away from said upper major surface by a predetermined first dimension, said lower major surface having a notch extending laterally across a midsection thereof between said opposed pair of edges with said notch extending upwardly from said lower major surface by a dimension substantially equal to said predetermined first dimension, wherein said laterally extending ridge is parallel to and disposed vertically above said laterally extending notch; and

(b) splitting said member along a center of both said ridge and said notch to define a pair of said construction blocks, wherein each said construction block has rough textured front surface defined by splitting the member in half, a recess extending laterally thereunder, and a lip extending laterally thereover wherein the height of said lip is substantially equal to the depth of said recess.

2. The method as specified in claim **1** further comprising the step of selectively defining the width of said laterally extending notch to correspond to a selected wall setback defined when said blocks are stacked with the lip of a lower said block disposed within and substantially filling the recess of a said block stacked thereupon.

3. The method as specified in claim **2** wherein said laterally extending ridge is defined with a width equal to the width of the defined notch such that a vertically extending wall can be formed using said blocks.

4. The method as specified in claim **3** wherein said member is formed such that both said laterally extending notch and said laterally extending recess bisect said member such that a pair of identical said blocks are formed upon splitting said member.

5. The method as specified in claim **3** wherein said laterally extending ridge is further defined to have a groove laterally extending across a center thereof and bisecting said ridge into a pair of laterally extending lips.

6. The method as specified in claim **5** wherein said groove is formed to have a generally V-shaped cross section.

7. The method as specified in claim **1** further comprising the step of forming at least one vertically extending core each side of said laterally extending ridge and said notch.

8. The method as specified in claim **7** further comprising the step of forming a pair of said cores each side of said laterally extending ridge and said notch, each said pair of cores being separated from each other by a core support web member extending between opposed surfaces of said member and through said ridge.

9. The method as specified in claim **8** wherein each said core support member is defined to extend perpendicular to said laterally extending ridge and said notch.

10. The method as specified in claim **1** further comprising the step of defining said laterally extending notch to have a rectangular cross section.

11. The method as specified in claim **1** further comprising the step of defining said laterally extending notch to have a

trapezoidal cross section, and defining said laterally extending ridge to have a pair of tapered surfaces.

12. The method as specified in claim 1 further comprising the step of defining said member to have a rectangular profile such that each said defined pair of construction blocks has a rectangular profile.

13. The method as specified in claim 1 further comprising the step of defining said member to have a generally hexagon profile such that each said defined pair of construction blocks has a front wall, a rear wall, and a pair of side walls each tapering from said front wall to said back wall, wherein said front wall is greater in length than said rear wall.

14. The method as specified in claim 1 further comprising the step for forming a retaining wall from said defined construction blocks.

15. The method as specified in claim 14 wherein said retaining wall is formed to have a setback.

16. The method of creating a construction block adapted to form retaining walls or the like comprising the steps of:

(a) preparing a mold box for receiving raw concrete with the mold box having opposed front and rear walls and opposed side walls and with the opposed lateral side walls having parallelly disposed horizontally aligned rectangular core bar receiving openings formed along the lower edges thereof;

(b) inserting an elongated rectangular core bar within said mold box extending between said parallelly disposed horizontally aligned openings for forming a notch;

(c) loading raw concrete within said mold box while forming cores within said raw concrete along a vertical axis normal to the axis of said core bar to form a member having a major upper surface and major lower surface and a plurality of edges, said major upper surface formed with a ridge; and

(d) splitting said member along a center of both said ridge and said notch to define a pair of said construction blocks, wherein each said construction block has rough textured front surface defined by splitting the member in half, a recess extending laterally thereunder, and a lip extending laterally thereover wherein the height of said lip is substantially equal to the depth of said recess.

17. The method as defined in claim 16 being particularly characterized in that said method includes placing said mold box upon the surface of a conveyor belt to form said lower major surface, and with the top surface of said conveyor belt forming said lower major surface.

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